Keywords: Blood/Transfusion/Consent/Patient information

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Patients needing blood transfusions should be told about risks and benefits of the procedure so they can give informed consent before it is undertaken

BLOOD TRANSFUSIONS: PART 1 OF 5

Gaining informed consent for blood transfusion

In this article...

- Gaps in patient information
- Guidance and training resources on consent for transfusion
- When consent for transfusion should be regularly reviewed

Authors Emma Whitmore is Patient Blood Management practitioner; Rebecca Gerrard is national lead; Kairen Coffey is education and audit lead; all at NHS Blood and Transplant Patient Blood Management Team.

Abstract Whitmore E et al (2014) Blood transfusions 1. Gaining informed consent for blood transfusion. *Nursing Times;* 110: 36, 12-14.

Transfusion of blood and blood products is a common procedure that has significant benefits but is also associated with serious risks. Patients needing blood transfusion require full information on these benefits and risks in order to make informed consent.

This article, the first in a five-part series, discusses the process of gaining consent and resources available to support patients and health professionals in this.

The government's vision for the NHS is one that puts patients first, where "no decision about me, without me" is the norm. In a time of great change and scrutiny in the NHS, an ever-greater emphasis is being placed on the patient's experience, putting the patient first, safeguarding the patient and person-centred care. At the same time, patients increasingly wish to be active participants in their own care. This article addresses fundamental aspects of patient safety and patient awareness when a blood transfusion is being considered.

The National Institute for Health and Care Excellence (NICE, 2012) recommends that "patients are supported by healthcare professionals to understand relevant treatment options, including benefits, risks and potential consequences"; this includes blood transfusion.

Patients should be given oral and written information as well as support to allow them to actively participate in their care and self-management (NICE, 2012). This principle is at the heart of the National Blood Transfusion Committee's (2014) Patient Blood Management (PBM) initiative. Supported by NHS England, the initiative is being promoted by NHS Blood and Transplant (NHSBT) and implemented across England and North Wales. PBM aims to ensure that patients who may need a blood transfusion as part of their treatment receive the best possible care.

The initiative recommends that:

- Any medical procedure, including blood transfusion, that takes place in a non-emergency situation, needs the patient or a representative to give informed consent;
- In an emergency, someone else may have to make this decision for the patient if the patient is incapable of giving consent;
- If the patient or relatives have any questions, concerns or objections, they have the opportunity to discuss them with a health professional before their treatment starts.

NHSBT provides a range of education resources related to transfusion, including a series of free patient-information leaflets (PILs) for adults and children. Many transfusion practitioners keep a stock of these but they are also available online; further information of how they can be obtained is outlined in Box 1. NHSBT's PILs are

5 key points

1 **Patients have the right to take part in decisions about their treatment and should be given information to promote active participation**

2 **NHS Blood and Transplant provides a range of transfusion-related resources**

3 **Valid consent must be gained from a patient or their representative before treatment**

4 **Documented valid consent is required for every blood transfusion. When this is not possible, patients should be given information retrospectively**

5 **Involving patients in their care and obtaining consent should be a routine part of practice**

Education leaflets are available for children

"Changes in healthcare delivery will provide challenges"

Andrea Denton › p24

designed and updated by a subgroup of the National Blood Transfusion Committee, which includes members of the NHSBT Patient Blood Management Team, transfusion consultants, hospital-based transfusion practitioners and patients. The leaflets are reviewed annually and amended to ensure they contain current and accurate information. They are classed as "controlled documents" so new editions are clearly marked with the date and version number – old versions must not be used.

In clinical situations patients may forget or misunderstand verbal explanations because they are anxious or unfamiliar with medical language. PILs provide the information needed to give them the time to consider the treatment options available and think of any questions they would like to ask.

Consent for blood transfusion

Despite the wealth of information available, patients are not always:

- Given information on the risks, benefits and alternatives to transfusion, or the right to refuse this treatment;
- Made aware they have received a transfusion;
- Made aware they can no longer donate blood as a result of this treatment. This step was implemented by all four UK Blood Services in August 2004. It is a precautionary measure against the possible risk of variant Creutzfeldt-Jakob Disease (vCJD) being transmitted by blood and blood products. This condition is thought to be the consequence of eating contaminated beef, related to bovine spongiform encephalopathy ("mad cow disease") in UK cattle after 1980. Fortunately, vCJD is extremely rare but there is evidence that it may be transmitted from an infected blood donor to a patient, via transfusion.

There is evidence of inconsistent practice around information and consent across the UK (Advisory Committee on the Safety of Blood, Tissues and Organs (SaBTO), 2011). SaBTO advises UK government ministers and the devolved administrations, as well as UK health departments, on the most appropriate ways to ensure the safety of blood, cells, tissues and organs for transfusion or transplant. As an outcome of a public consultation in 2010, a series of recommendations were proposed and supported by the SaBTO committee relating to all aspects of consent, including:

- Clinical practice;
- Governance;
- Patient information;
- Health professionals' education (SaBTO, 2011).

SaBTO recognised that the General Medical Council already has in place a generic standard for consent (GMC, 2008). However, it identified a need to strengthen the governance and the overseeing of consent for blood transfusion (SaBTO, 2011).

Valid consent

It is a general, legal and ethical principle that valid consent should be obtained from patients before they are treated (SaBTO, 2011). Valid consent can be defined as:

> *"An ongoing agreement by a person to receive treatment, undergo procedures or participate in research, after the risks, benefits and alternatives have been adequately explained to them"* (Department of Health, 2009).

Health professionals should document valid consent for blood-component transfusion (red cells, platelets, fresh frozen plasma, cryoprecipitate and/or granulocytes) in patients' clinical records (SaBTO, 2011). Patient do not need to give written consent, although trusts and other healthcare providers should have policies and procedures in place that explain how consent is obtained and recorded within their organisation. It is also recommended that transfusions be recorded in discharge summaries (NHSBT, 2013).

Patients who require long-term, regular transfusions – for example, those with haemoglobinopathy or haematology conditions – need to have updated information and regular reviews of consent for the transfusions they receive, reflecting any changes in the risks of transfusion or in their condition or treatment options. Details of consent requirements for these patients should be explicit in local transfusion policies (SaBTO, 2011).

Patients who are not able to give valid consent before having a transfusion – for example, in an emergency situation – should be provided with information retrospectively. This should include advice that the patient will no longer be eligible to donate blood, which should also be documented in the patient's clinical record.

Resources

All health professionals caring for patients who may need a transfusion should be able to answer questions they may have about the transfusion process. Learnbloodtransfusion (www.learnbloodtransfusion.org.uk) is a nationally recognised e-learning package developed by the UK Blood Services to provide regular transfusion training to all NHS health professionals involved in the transfusion process. As a direct result of the SaBTO

BOX 1. RESOURCES FOR PATIENTS

Patient information leaflets

The following leaflets are currently available from NHS Blood and Transplant:

- *Will I Need a Blood Transfusion?*
- *Information for Patients who have Received an Unexpected Blood Transfusion*
- *Will I Need a Platelet Transfusion?*
- *Information for Patients Needing Irradiated Blood*
- *Iron in your Diet*
- *Blood Groups and Red Cell Antibodies in Pregnancy*
- *Will Your Child Need a Plasma Transfusion?*
- *Patients' Guide*
- Children's leaflets
- *Will my Baby Need a Blood Transfusion?*

All leaflets are available at tinyurl.com/NHSBT-PILs or can be ordered free in English and Welsh at: ww3.access-24.co.uk. Login and password details are available from transfusion practitioners. A patient information leaflet on blood transfuson, which is developed and maintained by Scotblood, is used in Scotland.

Other recommended sources of information

- A video available on the NHS Choices website (tinyurl.com/NHS-TransfusionVideo) describes why patients might need a transfusion and how blood is tested to reduce the risk of infection
- Patient information on transfusion issues is available on NHSBT's Give Blood website (www.blood.co.uk). This features information on blood transfusion including frequently asked questions, patient-awareness campaigns and information for those receiving specialist therapies such as plasma exchange

recommendations, a new e-learning module called Consent for Transfusion is available to help health professionals ensure valid consent is obtained. This module, which has been developed by clinicians and nurses, covers the background and rationale for consent for transfusion. It should be used in conjunction with modules on Safe Transfusion Practice and Blood Components, and Indications for Use.

Individual trusts will have their own local policy on obtaining informed consent; transfusion practitioners should be able to direct health professionals to these policies and implement them.

Additional resources developed by SaBTO to help support consent for blood transfusion include:

- An action plan to support the delivery of SaBTO (2011) recommendations on consent (http://www.transfusionguidelines.org.uk/transfusion-practice/consent-for-blood-transfusion);
- A standardised information resource for clinicians, indicating the key issues to be discussed when obtaining consent for a blood transfusion from a patient;
- A good-practice guidance document on providing retrospective information to patients who were unable to give consent before a transfusion was carried out;
- A PowerPoint presentation developed by the NHSBT PBM Team to enable health professionals to cascade the key messages and impact of the SaBTO recommendations is available.

This resource is available on request from NHSBT.xxxxxxxxxxxxxxx@xxxxx.xxx.uk. Further guidance on general consent is available from documents published by the GMC (2008) and Nursing and Midwifery Council (2012).

TRANSFUSION SERVICES

There are four UK Blood services:

- **NHS Blood and Transplant**
www.blood.co.uk
- **Welsh Blood Service**
www.welsh-blood.org.uk
- **Scottish National Blood Transfusion Service**
www.scotblood.co.uk
- **Northern Ireland Blood Transfusion Service**
www.nibts.org

There are roughly 1.3 million active blood and platelet donors in England and North Wales and more than 6,000 donors give blood every day. In 2013-14, NHSBT collected more than 2 million units of whole blood and platelets. (A unit of blood is measured as 470ml, or just under a pint.)

Conclusion

The process of involving patients in their care, informing them of the risks, benefits and alternatives to transfusion, and then obtaining their consent for treatment (including the right to refuse), should be a routine part of clinical care. Staff involved in any stage of the transfusion process must accept responsibility and accountability for the care of the patient, even if they themselves are not authorising or administering the transfusion. **NT**

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NHS Blood and Transplant (2013) *Transfusion Matters: Patient Involvement and Empowerment.* tinyurl.com/TransfusionMatters11-NHSBT

Nursing and Midwifery Council (2012) *Consent.* tinyurl.com/ConsentNMC

MAKING BLOOD TRANSFUSION SAFE

Transfusion of blood components is an everyday occurrence, with approximately 8,000 units of red cells alone being used in hospitals daily in the UK.

The NHS Blood and Transplant Patient Blood Management (PBM) Team – formerly the Better Blood Transfusion Team – works with health professionals across England and North Wales to promote safe and appropriate use of blood components. Rebecca Gerrard is the national lead, there are three regional leads, a small education and audit team and 11 PBM practitioners (senior scientists and nurses) who are regionally based across the country.

The PBM Team collaborates with a range of national groups, produces patient information leaflets and educational resources, publishes articles in a range of healthcare journals and runs regional and national education events.

PBM is an evidence-based, multidisciplinary approach to optimising the care of patients who might need transfusion. It firmly places the patient at the centre of the decision-making process, considering transfusion when there is clear evidence that it is the best therapeutic treatment available once all other options have either been used or systematically considered and excluded.

Blood transfusion saves and improves lives for many patients every year but, as with any clinical intervention, there are risks associated with it. Nurses need to be aware of, and understand, these hazards as well as the steps that are required to minimise the risk of harm to patients.

The PBM Team strives to educate and support clinical staff in making each transfusion safe, effective and appropriate for every patient every time. By promoting strategies for blood avoidance, measures to reduce the inappropriate use of red cells, platelets and fresh frozen plasma, and increasing the use of alternatives to transfusion, it aims to improve patient care and reduce costs to the NHS.

This series of articles by the PBM Team demonstrates how best practice can be achieved in all aspects of transfusion. The five articles in the series cover the following subjects:

- Patient information and consent (in this issue);
- Blood transfusion: processing, storage, testing and selection (10 September);
- Safe administration (17 September);
- Transfusion reactions (24 September);
- Patient blood management (1 October).

Anne Davidson is Patient Blood Management practitioner, NHS Blood and Transplant Patient Blood Management Team

Keywords: Blood/Transfusion/Safety

●This article has been double-blind peer reviewed

Transfusing patients with incompatible blood components can be fatal. Understanding the testing and transfusion process can help reduce errors

BLOOD TRANSFUSIONS: PART 2 OF 5

Processing, testing and selecting blood components

In this article...

- How blood components should be stored
- Which blood groups are incompatible with each other
- Methods used to match recipients with suitable components

Authors Alister Jones is patient blood management practitioner at NHS Blood and Transplant, Filton; Jennifer Heyes is patient blood management practitioner at NHS Blood and Transplant, Tooting.

Abstract Jones A, Heyes J (2014) Blood transfusion 2: processing, testing and selecting blood components. *Nursing Times;* 110: 37, 20-22.

Transfusion of blood components can be an essential and lifesaving treatment for many patients. However, components must comply with a number of national requirements to ensure they are safe and fit for use. Transfusion of incorrect blood components can lead to mortality and morbidity in patients, which is why patient testing and blood selection are important. This second article in our five-part series on blood transfusion outlines the requirements for different blood components, the importance of the ABO and RhD blood group systems and the processes that ensure the correct blood component is issued to each patient.

Whole blood given at donation is separated into three constituent parts for therapeutic use: red blood cells; platelets; and plasma. These are known as blood components. They are usually transfused independently of each other according to the clinical requirements of the patient. All three components can be collected individually from whole blood by a process called apheresis, also referred to as component donation. Apheresis involves the donor's circulation being connected to a machine in a closed circuit; blood is taken from the donor, separated into component parts and the desired component collected and removed, with the rest returned to the donor. All blood donations are tested to determine the ABO and RhD blood group; this is explained in further detail below.

During whole blood donation, around 475ml of blood is drawn off (MacLennan, 2013), to be processed. White blood cells are filtered out during processing (leucodepletion), to reduce the risk of transmission of variant Creutzfeldt–Jakob disease (vCJD) (Cardigan and Thomas, 2013). All donations are tested for HIV, hepatitis B and C, human T-cell lymphotrophic virus (HTLV) and syphilis. The blood is then centrifuged so it separates into three layers:

- Red blood cells at the bottom;
- Plasma at the top;
- A buffy coat (containing platelets) in the middle.

These layers are pressed out into separate bags. To reduce the risk of contamination, separation of blood components is carried out using an entirely closed system, so they are never exposed to open air.

Every whole-blood and apheresis donation is given a unique donation number, which is then applied to all components derived from that donation, allowing every component to be traced from donor to recipient (MacLennan, 2013).

Red cells

Once separated, red blood cells are resuspended in an additive solution (for example SAG-M, a mix of saline, adenine, glucose and mannitol), intended to provide energy and stability for the cells. This

5 key points

1. Death or severe harm due to an ABO-incompatible transfusion is classified by the Department of Health as a "never event"
2. All blood components and laboratory testing procedures must comply with Blood Safety and Quality Regulations 2005 requirements
3. The ABO and RhD blood group systems are the most clinically significant
4. All blood components have strict storage conditions to minimise bacterial growth and ensure clinical efficacy
5. Red cell antibodies in a patient's plasma may delay the provision of red cells

All blood donation samples must be tested

Alamy

results in a unit of "red cells in additive solution" (also simply called "red cells"), which has a mean volume of 274ml and may still contain up to 30ml of residual plasma (Kosmirak, 2014).

The red cells component from a donation may be further split into smaller packs to be used for neonates; they are never mixed with blood from other donations – one unit of red cells of whatever size will only ever come from one donor.

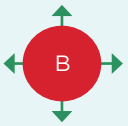
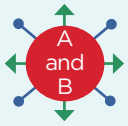
Red cells are stored at 2-6°C to minimise bacterial growth and slow cell metabolism (to maximise cell life) for up to 35 days (MacLennan, 2013). It is vital that monitored cold storage conditions (known as "cold chain") are maintained to optimise the red cells and meet regulatory requirements (tinyurl.com/BloodSafetyRegulations). Red cells can only be outside temperature-controlled conditions for up to 30 minutes – they must then go back into cold storage, be used or be returned to the transfusion laboratory to be discarded. Transfusion should be completed within four hours of removal from cold storage.

It is common to transfuse over 90-120 minutes per unit (British Committee for Standards in Haematology, 2009) but caution must be exercised when it comes to the red cell transfusion rate in patients with increased risk of circulatory overload. Blood components should be given only one unit at a time, except when managing a massive haemorrhage. Red cells may be irradiated for patients who are immunocompromised to reduce the risk of transfusion-associated graft versus host disease; this will also reduce the life of the cells, so they are issued with a reduced expiry time.

Plasma

The plasma part of a donation is frozen to make a unit of fresh frozen plasma (FFP) or processed to make cryoprecipitate, which has a higher concentration of fibrinogen and factor VIII, and then frozen (Norfolk, 2013). Freezing allows for long-term storage – up to 36 months at -25°C (MacLennan, 2013). When needed, these components can be thawed to 37°C in 15-30 minutes, depending on the thawing system used by the transfusion laboratory. Once thawed, FFP and cryoprecipitate can be kept for up to four hours at 20-24°C and should be transfused over 30 minutes per pack; alternatively, thawed FFP can be stored for up to 24 hours at 2-6°C. Plasma from male donors only is used to produce FFP and cryoprecipitate, as this is considered to have less risk of triggering a transfusion-related acute lung injury (TRALI) reaction in the recipient (Norfolk, 2013).

TABLE 1. ABO ANTIGENS AND ANTIBODIES

	ABO group			
	A	B	AB	O
Red cell antigens				
Red cell antibodies	 Anti-B	 Anti-A	None	 Anti-A and anti-B
Can receive RCCs group	A, O	B, O	AB, A, B, O	O
Can receive FFP group	A, AB	B, AB	AB	O, A, B, AB
Can receive platelets group[1]	A, AB, B, O[2]	B, AB, B, O[2]	AB, A, B, O[2]	O, AB, A, B

[1] Order of preference [2] High-titre anti-A/anti-B negative. FFP = fresh frozen plasma. RCC = red cell component.

Platelets

Platelets can be produced in two ways:

- The buffy coat of a donation may be pooled with those from three other donations to make a single platelet dose for transfusion (Norfolk, 2013);
- They can be acquired from a single donor by apheresis.

However platelets are made, an individual dose is called an adult therapeutic dose. Smaller packs of platelets are split from single apheresis donations and are called paediatric therapeutic doses. Platelets are resuspended either in plasma alone or in 70% platelet additive solution and 30% plasma; pooled platelets use only plasma from one male donor of the "pool" to reduce the risk of TRALI (Norfolk, 2013).

Platelets are stored at room temperature (20-24°C) on an agitator to prevent them aggregating (cells "clumping"); they expire after five days, or seven days if the unit undergoes bacterial screening (MacLennan, 2013). The shelf life of platelets is much shorter than that of red blood cells, which reflects the increased risk of bacterial growth at room temperature. Platelets can be irradiated, but this does not reduce the short shelf life. Both red cells and platelets are living cells and, as such, appropriate care should be taken in their handling and transport.

Red cell antigens and antibodies

All cells have molecules on their surface (antigens), which can stimulate an immune response in patients. Those present on the surface of red blood cells, known as red cell antigens, can react with antibodies called red cell antibodies. More than 300 red cell antigens have been classified into different "systems", which give rise to the different blood groups.

The red cell antibodies produced by the immune system each react with a specific red cell antigen. Red cell antibodies can be split into two notable groups:

- Naturally occurring antibodies to the A and B antigens of the ABO system;
- Acquired antibodies to all other red cell antigens.

Naturally occurring antibodies are produced in early life and are found in everyone after the first three months of life. Acquired antibodies are produced by exposing the immune system to foreign red cell antigens, most commonly by blood transfusion or pregnancy. Red cell antibodies are only produced against those antigens that a person's red blood cells do not express.

The ABO system

The most well-recognised and clinically important blood group system is the ABO system. The ABO groups are determined by whether red blood cells express A, B, A and B, or neither antigen on their surface; these correspond to the A, B, AB and O blood groups respectively. Incidence of each group varies by ethnic population, with group O being the most common in the UK donor population (Norfolk, 2013).

Antibodies to ABO antigens naturally occur and can be detected in plasma after three months of age. The antibody formed will react with the antigen not present on the patient's red cell. For example, a patient who has the B antigen on the red cell surface (blood group B) will have antibodies that react with the A antigen called anti-A. The antigens and antibodies of the ABO blood

group system are summarised in Table 1.

The ABO blood group is important because ABO-incompatible red cell transfusions can be fatal. During an ABO-incompatible transfusion, anti-A and/or anti-B in the patient's blood binds to the transfused red cells, leading to their destruction (haemolysis) and an inflammatory response that can cause shock, renal failure and disseminated intravascular coagulation. An ABO-haemolytic reaction can occur after transfusion of only a very small volume of incompatible cells. Transfusion of ABO-incompatible plasma containing anti-A and/or anti-B can cause destruction of the patient's red cells, especially in neonates. Haemolytic reactions can occur with other red cell antibodies/antigens, but these are not likely to be as severe.

Ensuring the patient receives the right blood component is the most important step in clinical transfusion practice: the recipient and donor unit should ideally be ABO identical, and must always be ABO compatible. Death or severe harm as a result of the inadvertent transfusion of ABO-incompatible blood components is listed as one of the Department of Health's "never events" (DH, 2012).

The Rh system

The Rh system comprises five main antigens, for which people are positive or negative: C/c, E/e and D. Of these, RhD is the most clinically important. Antibodies to RhD are formed only in RhD-negative people after exposure to the D antigen via transfusion of RhD-positive red cells or pregnancy with an RhD-positive baby.

The antibodies produced (called anti-D) can trigger a haemolytic transfusion reaction if RhD-positive red cells are transfused and can cause haemolytic disease of the foetus and newborn in later pregnancies. It is crucial therefore, to transfuse only RhD-negative red cells and platelets to girls and women with childbearing potential who are RhD negative; the only exception is in an emergency where no RhD-negative component is available in time, when prophylactic anti-D immunoglobulin cover must be given (Norfolk, 2013).

Compatibility procedures in the transfusion laboratory

To ensure the patient receives compatible blood components, a venous blood sample will be tested in the laboratory.

Group and screen testing

A "group and screen" test will determine the ABO and RhD group by assessing the red cell antigens present, then screen the plasma for any red cell antibodies that can cause a transfusion reaction (such as anti-D) (British Committee for Standards in Haematology, 2012). If a screen is positive, further testing will be done; this may affect how long it takes for blood to be available.

Pre-transfusion blood samples (group and screen and/or crossmatch) must be labelled with the patient's first name, last name, unique identification number (for example NHS number) and date of birth. In Wales, the first line of the patient's address is also required (BCSH, 2009), while in Scotland gender must be specified.

ABO grouping is the most important test performed on pre-transfusion samples. To help minimise ABO-incompatible transfusions, national guidelines now recommend taking a second sample and testing it to confirm the ABO group in patients where there is no record of a previous test result (BCSH, 2012). This is intended to prevent potential errors caused by "wrong blood in tube" incidents.

Selection methods

When a red cell transfusion is requested, the laboratory selects units that are ABO and RhD compatible and negative for antigens corresponding to any red cell antibodies that might have been detected in the plasma. Depending on the group and screen result, two main methods can be used to issue blood: electronic issue or serological crossmatch.

Electronic issue can be used if the patient's ABO and RhD group has already been established and the patient's plasma does not contain red cell antibodies (currently or historically). ABO and RhD-compatible red cell units are selected by laboratory staff, then a computer is used to check them against the patient's results before they are issued. Electronic issue is quicker than crossmatching and can allow issue of red cell units to be managed remotely using computer-controlled satellite fridges that may be located in the clinical area. This method also helps with stock control as units do not become tied up being "reserved" for specific patients.

If red cell antibodies have been detected in the patient's plasma, a serological crossmatch will be performed. The patient's plasma will be directly tested against a sample from the unit of red cells at 37°C to look for a reaction indicating incompatibility. Only units that are compatible (have no reactions) with the patient's plasma will be issued (Klein and Anstee, 2005). Units crossmatched for patients upon request are usually held in reserve for that patient for a given period of time (usually 24-48 hours, depending on local transfusion policy).

BLOOD TRANSFUSION SERIES

This series, produced by the NHS Blood and Transplant Patient Blood Management team, comprises five articles:

- Gaining informed consent for blood transfusion (3 September, www.nursingtimes.net/bloodtransfusion)
- Processing, testing and selecting blood components (10 September, www.nursingtimes.net/bloodcomponents)
- Safe administration of blood components (17 September)
- Managing blood transfusion reactions (24 September)
- Patient blood management (1 October)

Whichever method is used, a final bedside check between the patient, their wristband details and those on the blood component must be performed for every unit.

Conclusion

The ABO and RhD blood groups are the most clinically significant in blood transfusion medicine. It is important to ensure the patient's ABO and Rh blood group is determined before blood is issued. If no red cell antibodies are detected, blood will be matched for ABO and RhD groups. If red cell antibodies are detected, a sample from the blood component will be tested against the patient's plasma to make sure it is compatible. Blood components must be handled with care and stored correctly before use to ensure they are safe to transfuse. **NT**

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For more on this topic go online...

- Blood transfusions 1: How to monitor for adverse reactions
- **Bit.ly/NTTransfusionReaction**

Keywords: Blood/Components/Administration/Safety

●This article has been double-blind peer reviewed

Blood transfusion carries potentially serious hazards. Nurses have an important role in ensuring safe administration and in maintaining records to provide an audit trail

BLOOD TRANSFUSIONS: PART 3 OF 5

Safe administration of blood components

In this article...

- The hazards around transfusing blood and blood components
- How to avoid preventable errors
- Observations that should be carried out before, during and after a transfusion

5 key points

1. Avoidable errors in transfusion continue to occur
2. Positive patient identification is essential throughout the entire transfusion process
3. Full and clear documentation of transfusions is required by law
4. Clear, straightforward communication is vital
5. The checking process before transfusion should always be carried out at the patient's bedside

Author Katy Hurrell is patient blood management practitioner at NHS Blood and Transplant, South West Region.

Abstract Hurrell K (2014) Blood transfusion 3: Safe administration of blood components. *Nursing Times;* 110: 38, 16-19. The transfusion process has many stages, each involving different members of staff in different locations. This gives rise to a significant potential for errors. Nurses are involved in many of these stages and therefore require knowledge, skills and competence in the process to ensure the safety of patients.

This third article in our five-part series on blood transfusion discusses the safe administration of blood components and the key principles to which nurses must adhere.

Transfusion has many potential hazards, some of which are preventable. These include patient misidentification, which can lead to patients receiving the wrong blood and cause serious harm or even death.

Haemovigilance is the "systematic surveillance of adverse reactions and adverse events related to transfusion" (Norfolk, 2013). This aims to improve transfusion safety and adverse event reporting, which is mandatory in the UK; any serious adverse event or reaction that may lead to death or life-threatening/disabling conditions in patients, lengthens their stay in hospital or increases morbidity must be reported to the Medicines and Healthcare products Regulatory Agency (tinyurl.com/MHRA-blood-safety). There is also a UK-wide professionally led, independent haemovigilance reporting scheme called Serious Hazards of Transfusion (SHOT). Launched in 1996, it was the first of its kind in the world. Participation is voluntary but it is widely used; in 2012, 99.5% of NHS trusts and health boards reported incidents to SHOT (Bolton-Maggs et al, 2013). SHOT aims to educate practitioners on the risks of transfusion and improve practice standards.

Since 1996, SHOT has shown that episodes of the incorrect blood component being transfused – when the wrong blood was given to a patient – are frequently reported. In 2012, 252 such incidents were reported to SHOT; of these, 151 were down to errors that originated in the clinical area and 101 to errors in the laboratory. There were 10 incidents of patients receiving ABO-incompatible blood components (Fig 1) (Bolton-Maggs et al, 2013); three of these patients went on to experience "severe harm as a result of the inadvertent transfusion of ABO incompatible blood components". These are considered "never events" by NHS England (2013).

In total, 62.3% of serious transfusion incidents were caused by human error, often due to misidentification of the patient at sampling or at the time of transfusion (Bolton-Maggs et al, 2013). Many of these cases involved multiple errors during the transfusion process.

Transfusion process

The British Committee for Standards in Haematology (2009) has produced national guidance for hospitals on the

Clear evidence of the fate of every blood component issued is required by law

administration of blood components. This states that every stage of the transfusion process should be underpinned by three principles:

- Positive patient identification;
- Documentation;
- Communication.

Positive patient identification

Positive patient identification (PPI) is the act of positively identifying the correct patient by checking with the patient – it is the cornerstone of good care. Before any therapy is administered, practitioners must be sure they are treating the right patient. The key recommendation in the *SHOT Report 2011* was for a "back-to-basics" approach to transfusion, highlighting in particular the importance of "right patient, right blood" (Bolton-Maggs and Cohen, 2012). SHOT also stated that:

> *"Confirmation of identity at every stage of the transfusion process and good communication are essential to prevent errors" (Bolton-Maggs and Cohen, 2012).*

Many of the serious events reported to SHOT are due to basic PPI errors. It is the nurse's responsibility to ensure scrupulous attention is paid to the correct identification of both the blood component and the patient at every stage of the transfusion process. BCSH guidelines (2009) also state:

> *"A patient identification band (or risk-assessed equivalent) must be worn by all patients receiving a blood transfusion."*

The minimum identifiers should be: last name, first name, date of birth and unique patient identification number. In Wales, the first line of the patient's address is also required, and gender must be stipulated in Scotland. The patient identification number should be the NHS number in England and Wales, the Community Health Index number in Scotland and the Health and Social Care number in Northern Ireland. The name and date of birth should be checked with the patient verbally wherever possible and the identification band should also be used to positively identify the patient before every part of the transfusion procedure.

Documentation

In line with the Blood Safety and Quality Regulations 2005 (tinyurl.com/BloodSafetyRegulations), for traceability purposes, hospitals, blood management practitioners and nurses are required by law to have unambiguous evidence of the final fate of every blood component issued.

Nurses play a vital role in ensuring full documentation of the administration or other final fate of every unit, which provides an audit trail.

Individual trusts and health boards have local policies detailing how to achieve and demonstrate traceability of each unit. Hospital transfusion laboratories are required to maintain records that ensure full traceability from donation to the point of delivery for not less than 30 years (tinyurl.com/BloodSafetyRegulations).

Communication

As the transfusion process includes several steps involving various personnel in different departments, there is the potential for confusion and errors to occur.

Written or electronic communication should be used whenever possible; copying details from one document to another should be avoided where possible because of the potential for transcription errors leading to misunderstandings and errors.

Urgent written requests should be supplemented by telephone discussion between clinician and laboratory staff to clarify exactly what is required.

Local policies should be in place to minimise the risk of misinterpretation or errors relating to transfusion.

Prescribing blood components

Whole human blood and blood components are excluded from the legal definition of a medicine. According to the Blood Safety and Quality Regulations 2005, they cannot, therefore, be prescribed.

Although, traditionally, authorisation of blood components has been the responsibility of medical practitioners, there is no requirement for them to be authorised by a registered medical practitioner. There is no legal barrier to a nurse or midwife doing this, providing it is within their scope of practice. Authorisation can also be extended to other appropriately trained, competent healthcare practitioners working within locally agreed guidelines (Pirie and Green, 2010).

Blood components should only be authorised using an approved prescription sheet for intravenous fluids or on a special transfusion documentation chart (BCSH, 2009).

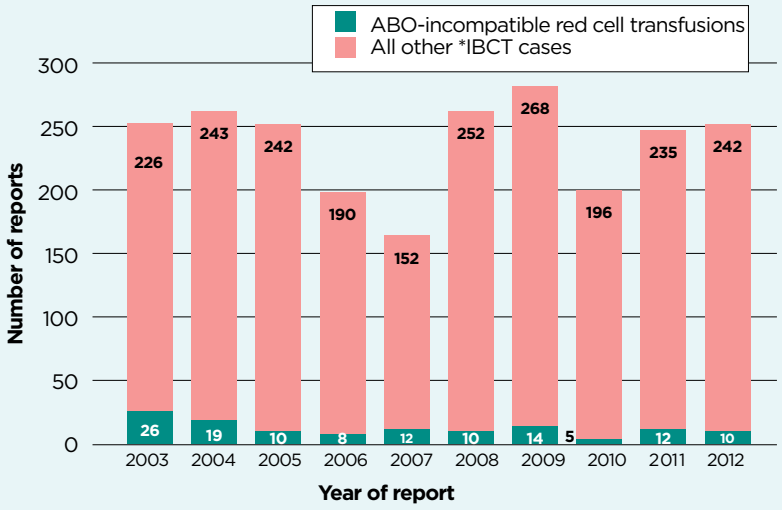
Preparing patients for a transfusion

Before collecting a blood component, the nurse should make sure the patient is prepared for the transfusion, a patent IV cannula is in place and a written and signed authorisation/prescription is available.

The patient should understand the reason for the blood transfusion and be aware of the risks and benefits. There should be clear documentation in the medical notes to show the patient's consent has been obtained after discussing the reason for transfusion and, ideally, considering alternatives if appropriate (Whitmore et al, 2014).

Baseline observations of pulse, blood pressure, temperature and respirations should be checked and recorded on the observation chart before the blood component is collected. These should not be recorded more than 60 minutes before the

FIG 1. **CASES REVIEWED BY SHOT, 2003-2012**



Reproduced with kind permission of Serious Hazards of Transfusion (Bolton-Maggs and Cohen, 2012)
*IBCT = incorrect blood component transfused.

start of the transfusion and should be checked before each blood component is transfused.

It is important to ensure all of these pre-transfusion checks have been completed before collecting the blood component.

Requesting and collecting the blood component

Written evidence of the patient's identity must be taken by the person collecting the component from the transfusion laboratory/fridge and checked against the blood component before collection.

All necessary paperwork must be signed at the time of collection to maintain the traceability trail of the blood component. If a trust or health board uses electronic systems, nurses should refer to their local trust policy and manufacturers' guidelines, which will be available from the hospital transfusion practitioner or transfusion laboratory.

The transfusion should begin as soon as possible after the component arrives at the clinical area. This helps to ensure the component will be transfused within the necessary time period and reduces the risk of a valuable resource being wasted. The transfusion must be completed within four hours of collection.

If, after collection, the blood component is no longer required, red cells can be returned to cold storage but only within 30 minutes of removal. Under no circumstances should blood components be stored in a ward fridge.

Final pre-transfusion checks

The final identification check between the blood component and the patient is the last opportunity to avoid the possibility of administering a potentially fatal incorrect component to the patient. This checking process is required for each individual blood component that is transfused, and should always take place at the patient's bedside. Trusts/health boards differ in their policies regarding the number of staff – one or two – who should perform these checks.

Parents/carers should be asked to confirm the identity of children receiving transfusions

The minimum requirement is that a registered healthcare practitioner, who is deemed competent and who will also administer the component, is present during the checking process (BCSH, 2009). If two people are checking the blood component against the patient, they should each do so independently to avoid the risk of one relying on the other to "get it right" (Watson et al, 2008). If the checking process is interrupted, it should be started again.

The check between the blood component and the patient should involve confirmation that the details on the patient identity band – whenever possible also confirmed verbally by the patient (positive patient identification) – match exactly the details on the label attached to the component and generated by the transfusion laboratory. Nurses should also check these details against the patient's prescription sheet. If patients are unable to confirm their own identity – for example, children or unconscious patients – a relative or carer should be asked to do so on their behalf.

The unique component donation number and the blood group on the

BOX 1. OBSERVATIONS DURING A BLOOD TRANSFUSION

The following observations at a minimum should be undertaken and documented for every blood component transfused:

- Before the blood component is collected, the patient's pulse, blood pressure, temperature and respirations should be checked and recorded on the observation chart the. This should not be done more than 60 minutes before the start of the transfusion and should be checked before each component is administered.
- Temperature, blood pressure and pulse should be checked and recorded 15 minutes after the start of the transfusion.
- Pulse, blood pressure and temperature should be checked and recorded within 60 minutes of the transfusion being completed (BCSH, 2009).
- In addition to these recorded observations, before the transfusion is started, patients should be encouraged to inform nursing staff immediately if they are aware of any of the following symptoms – shivering, pain or shortness of breath.
- Visual observation of the patient throughout the transfusion by nursing staff is essential (BCSH, 2009). Transfusion must take place only when there are enough staff available to monitor the patient and where the patient can be readily observed.
- Additional observations should be made as indicated by the patient's condition or the local hospital policy.

component pack must be the same as those on the laboratory-produced label attached to the blood component (BCSH, 2009). The nurse should also check the expiry date and time and carry out a visual check of the component to ensure there is no leakage, discolouration or clumping.

Any discrepancies or concerns should be immediately reported to the laboratory and the transfusion must not be started until these issues have been fully resolved. All checks carried out must be signed for and documented according to local policy.

Safe administration

Blood components should be administered only by registered practitioners who have been trained and assessed as competent according to local policies (Norfolk, 2013; BCSH et al, 2009). The BCSH advises that such training be undertaken at least every two years and practitioners be assessed as competent every three years in accordance with the relevant regulations, standards and notices (BCSH, 2009).

On a practical note, transfusions should only take place when enough nursing staff are available to care for and observe the patient. Non-essential overnight transfusions should be avoided unless clinically indicated, because of the increased risk of errors and the difficulty in observing patients for signs of a reaction (BCSH, 2009).

As with any IV infusion, blood should be administered aseptically. Protecting patients from cross-contamination and staff from needlestick injury is paramount and appropriate sharps disposal and universal precautions must be observed.

While a patient is receiving a transfusion, observation and monitoring are important to ensure acute transfusion reactions can be recognised early and treated.

Recommended observations are outlined in Box 1.

Nurses should document clearly in the patient's notes all details of transfusion and observations as soon as possible after an adverse event occurs (Nursing and Midwifery Council, 2008). These should include details of:

- Staff administering the transfusion;
- Date, start and finish time of each component transfused;
- Donation number of each component;
- A record of all of the observations made before, during and after the transfusion.

If a transfusion reaction is suspected, the transfusion should be stopped immediately, and medical and laboratory staff informed. This should be clearly documented in the patient's notes.

After transfusion

The BCSH (2009) recommends a minimum of post-transfusion observations of pulse, blood pressure and temperature be taken not more than 60 minutes after the tranfusion has been completed. However, it is now widely recognised that adverse reactions to transfusions can occur many hours after that time and further observations should be undertaken as clinically indicated.

Patients staying in hospital must be made aware that if they experience any signs or symptoms of a possible reaction (shivers, rashes or shortness of breath), they should tell nursing staff. Day patients discharged within 24 hours of receiving a transfusion should be given a contact card explaining how to access clinical advice in the event of any concerns.

Conclusion

Blood transfusion is a common, safe procedure. However, avoidable errors can – and do – occur. Health professionals must adhere to the basic principles of PPI, good communication and clear documentation to reduce the chances of preventable errors being made. **NT**

BLOOD TRANSFUSION SERIES

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- Gaining informed consent for blood transfusion (3 September, www.nursingtimes.net/bloodtransfusion)
- Processing, testing and selecting blood components (10 September, www.nursingtimes.net/bloodcomponents)
- Safe administration of blood components (17 September)
- Managing blood transfusion reactions (24 September)
- Patient blood management (1 October)

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For more on this topic go online...

- Patient identification in blood sampling
- **Bit.ly/NT-blood-sampling**

Keywords: Blood/Transfusion/Reaction/Patient safety

●This article has been double-blind peer reviewed

Patients receiving blood transfusions can die if errors are made and if the signs of a severe reaction are not recognised and acted on at an early stage

BLOOD TRANSFUSIONS: PART 4 OF 5

Recognising and managing transfusion reactions

In this article...

- Recognising a negative reaction to a blood component transfusion
- How to manage and report the reaction
- What can be done to improve patient safety

Authors Denise Watson is regional lead, Patient Blood Management Team at NHS Blood and Transplant, Newcastle; Clare Denison is Patient Blood Management practitioner at NHS Blood and Transplant, London.

Abstract Watson D, Denison C (2014) Blood transfusions 4: recognising and managing transfusion reactions. *Nursing Times;* 110: 39, 18-21.

Blood transfusion reactions are rare and vary in the degree of harm they cause the patient. In some cases, it may be clear on visual examination that a patient is having a severe reaction to a blood component; however, it may not be clear in all situations, especially if the patient is already unwell. This article focuses on how to recognise a reaction to a blood component, manage that reaction, and inform the relevant staff and organisation. It also discusses how transfusion safety can be improved.

The Serious Hazards of Transfusion (SHOT) scheme was established in 1996 to improve transfusion safety by monitoring adverse events and reactions. In its 2013 review, there were 3,568 incident reports, with nine reports of ABO-incompatible red cell transfusions, four of which were classified as "never events" (that is, the reaction resulted in serious harm or death and could have been prevented) (Bolton-Maggs et al, 2014). In 2013, 99.5% (182/183) of NHS trusts/health boards were registered to report to SHOT directly or indirectly (Bolton-Maggs et al, 2014).

It is important that hospital transfusion teams (HTTs) report transfusion errors and near misses to SHOT. They should be treated with the same level of concern as all other serious incidents and should be fully investigated for root causes and corrective and preventive actions applied.

Serious transfusion reactions must be reported to the Medicines and Healthcare products Regulatory Agency through the Serious Adverse Blood Reactions and Events reporting portal, as mandated under the 2005 Blood Safety and Quality Regulations (tinyurl.com/BloodSafetyRegulations). Only actual incidents should be reported to MHRA; it does not accept near miss reports.

Transfusion reactions can occur:

- Immediately;
- Within 24 hours of a transfusion (acute reactions);
- More than 24 hours after a transfusion (delayed reactions).

As reactions can occur several days after transfusion, the British Committee for Standards in Haematology's *Guideline on the Administration of Blood Components* (Harris et al, 2009) recommends patients discharged within 24 hours of having a transfusion are given a contact card giving them 24-hour access to clinical advice.

Fig 1 shows the times between transfusion and recognition of a delayed reaction for cases reported to SHOT in 2013 (Bolton-Maggs et al, 2014).

Type and causes of transfusion reactions

Acute haemolytic transfusion reaction

Acute haemolytic transfusion reaction occurs when a transfusion of incompatible

5 key points

1. It is essential to check the patient's identity before transfusing a blood component
2. Observations must be taken and recorded before blood components are administered
3. These should be compared with observations recorded during and at the end of a transfusion
4. Transfusion reactions can occur immediately, within 24 hours of a transfusion or more than 24 hours after a transfusion
5. Nurses should know the signs of a transfusion reaction, when to report signs, and how and to whom they should be reported

Scanning technology can reduce the risk of transfusion errors

red cells causes an acute severe clinical reaction between the transfused red cells and usually, but not always, the patient's own anti-A or anti-B antibodies. In rare situations, it can be caused by other antibodies (Jones and Heyes, 2014).

Patients who are conscious often become very unwell within the first few minutes of transfusion, complaining of flushing, loin and abdominal pain, and "a feeling of impending doom" (Norfolk, 2013). In patients who are unconscious, the first indication of a reaction may be tachycardia, hypotension or bleeding into the skin or from needle wounds, which may resemble bruising.

Febrile reactions

Febrile reactions can vary in severity and occur because the antigens on the blood component react with the patient's white cell antibodies. These reactions have become less common since the introduction of universal leucodepletion (filtering) of blood components by NHS Blood and Transplant (Jones and Heyes, 2014).

Characterised by fever, and sometimes accompanied by shivering, muscle pain and nausea, febrile reactions can occur up to two hours after completion of the transfusion. They can be classified as:

- Mild: pyrexia of >38°C, but <2°C rise from baseline;
- Moderate: pyrexia of >2°C above baseline or >39°C, or rigors and/or myalgia (muscle pain).

Allergic reactions

Allergic reactions include anaphylaxis, urticaria or a rash, and can be mild, moderate or severe. Shock or severe hypotension associated with wheeze (bronchospasm), stridor from laryngeal oedema or swelling of the face, limbs or mucous membranes (angioedema) strongly suggest anaphylaxis.

Symptoms of mild reactions are confined to itching (pruritus) and/or skin rash ("nettle rash" or hives) with no changes in vital signs. They often improve if the transfusion is slowed and antihistamine administered orally or intravenously.

Transfusion-transmitted infection

Transfusion-transmitted infection occurs as a result of bacterial or viral contamination of blood components. Bacterial contamination is more common with platelets as they are stored at 22°C, which can lead to greater bacterial proliferation. However, viral contamination can be present in any blood component.

Transfusion of a blood component contaminated with bacteria often causes an acute severe reaction soon after the transfusion has started. Initially, this may be indistinguishable from an acute haemolytic reaction or severe allergic reaction. Inspection of the pack may show abnormal discolouration, aggregates or an offensive smell, but many contaminated packs appear normal. Typical symptoms and signs include rigors, fever (usually >2°C above baseline), hypotension and rapidly developing shock and impaired consciousness.

Blood cultures should be taken from the patient and treatment started immediately with an intravenous, broad-spectrum antibiotic combination covering Gram-negative and Gram-positive bacteria (the local empirical antibiotic regimen used in patients with neutropenic sepsis is appropriate) (Norfolk, 2013).

Implicated units should be sealed to avoid leakage or contamination and returned to the transfusion laboratory for investigation. The blood transfusion centre must be contacted (usually by the hospital transfusion laboratory staff) so any associated components from the implicated donor can be urgently identified and withdrawn from transfusion laboratories.

Transfusion-related acute lung injury

Transfusion-related acute lung injury is caused by antibodies in the donor plasma that react with the patient's white cells (neutrophils and monocytes) or pulmonary endothelium (cells that line the lungs); this reaction is more common with plasma-rich components such as fresh frozen plasma (FFP). Inflammatory cells are sequestered in the lungs, causing leakage of plasma into the alveolar spaces. This results in non-cardiogenic pulmonary oedema.

Most cases present within two hours of transfusion (maximum within six hours) with severe breathlessness and a productive cough of frothy pink sputum. It is often associated with hypotension (due to loss of plasma volume), fever, rigors and transient peripheral blood neutropenia or monocytopenia (temporarily reduced white blood cell count).

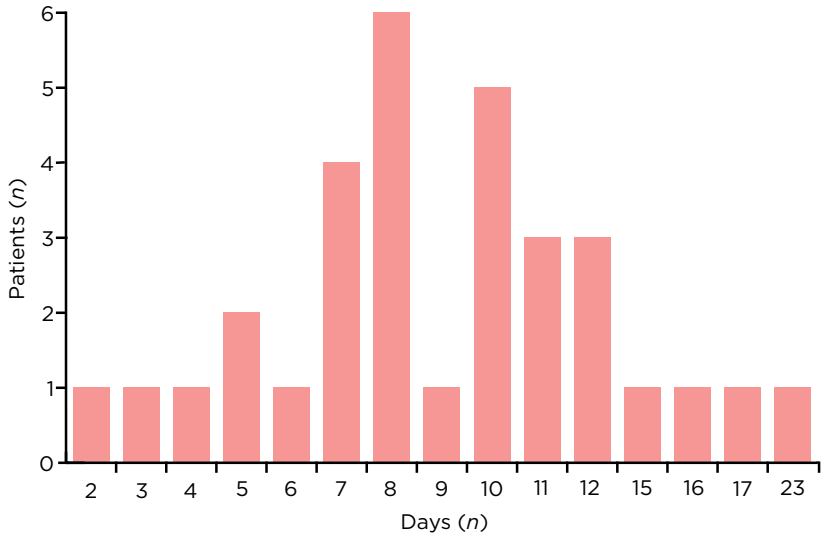
Transfusion-associated circulatory overload

Too much blood being transfused too quickly – especially to vulnerable groups including neonates or older people – can lead to acute left ventricular failure. Typical features include acute respiratory distress, tachycardia, hypertension and evidence of a positive fluid balance.

Transfusion-associated dyspnoea

Transfusion-associated dyspnoea is characterised by respiratory distress within 24 hours of transfusion that does not meet the criteria of transfusion-related acute lung injury, transfusion-associated circulatory overload or allergic reaction. Any underlying condition that could

FIG 1. **DELAYED TRANSFUSION REACTIONS REPORTS**



Delayed transfusion reactions (that is, occurring more than 24 hours after transfusion) reported in 2013 were detected 2-23 days after transfusion. A total of 49 haemolytic transfusion reactions were included in the 2013 SHOT report, 32 of which were classified as delayed reactions.

Source: Serious Hazards of Transfusion (2014)

Alamy

TABLE 1. NUMBER OF WRONG BLOOD COMPONENTS TRANSFUSED IN 2013

Outcome	Reports (*n*)	Blood component
ABO incompatible	12*	
	9	RBC
	3	FFP
ABO non-identical	7	
	4	RBC
	2	Platelets
	1	FFP
RhD mismatch	8**	
	6	RBC
	2	Platelets
Wrong component type	17	
	3	Cryoprecipitate
	5	RBC
	2	FFP
	7	Platelets
ABO identical	8	
	7	RBC
	1	FFP
Spiked before pre-admission checks (will be classified as "near miss" in future)	5	
	4	RBC
	1	Platelets
Total wrong components transfused	**57**	

*Three ABO incompatible transfusions related to transplant cases (two HSCT patients, one liver transplant patient). **Three cases RhD mismatched blood components transfused to HSCT patients. FFP = fresh frozen plasma. HSCT = hematopoietic stem cell transplantation. RBC = red blood cells.
Source: Serious Hazards of Transfusion (2014)

have caused the respiratory distress should be ruled out.

Delayed haemolytic transfusion reactions

If a patient has an antibody that may not have been detectable by routine blood testing, transfusing a unit of red cells that contain the corresponding antigen can cause a reaction. Haemolysis (breakdown of red blood cells) becomes clinically apparent up to 14 days after a transfusion; signs may include a falling haemoglobin concentration or failure to achieve the expected increment (a rise in Hb level after transfusion), jaundice, fever and occasionally haemoglobinuria (presence of haemoglobin in the urine) or acute renal failure.

Transfusion-associated graft-versus-host disease

Residual white cells in the transfused blood components can replicate and mount an immune response in patients who are immunocompromised. Symptoms classically occur 7-14 days (maximum 30 days) after a transfusion with fever, skin rash, diarrhoea, disturbed liver function and worsening bone-marrow aplasia; the condition is almost always fatal.

Post-transfusion purpura

Post-transfusion purpura occurs in patients who have a platelet-specific antibody that leads to a significant drop in platelet count after transfusion. Affected patients develop a low platelet count and bleeding occurs 5-12 days after a transfusion of red cells. Bleeding may occur from the gastrointestinal tract and epistaxis is common. The mortality rate is 9%; death results from intracranial haemorrhage (Taylor, 2008).

Recognising a transfusion reaction

In some cases, it is clear on visual examination that a patient is having a reaction to a blood component, but this is not always the case, especially if a patient is already very ill. A reaction can be suspected from a change in the patient's vital signs or on the basis of any sudden unexpected change/deterioration in their condition during or immediately after the transfusion. It is also possible for a transfusion reaction to be delayed and become apparent more than 24 hours following the transfusion.

The BCSH (2009) guidance recommends that observations are taken and recorded as follows:

- Pulse rate, blood pressure, temperature and respiratory rate no more than 60 minutes before the blood transfusion is started;
- Pulse rate, blood pressure and temperature 15 minutes after the start of each blood component – if these readings are significantly different from the baseline observations, the respiratory rate should also be included;
- Pulse rate, blood pressure and temperature no more than 60 minutes after the end of the transfusion.

These recommendations are the minimum observations that should be recorded, and local policies may differ. If a patient deteriorates or a transfusion reaction is suspected, the transfusion should be stopped, observations must be taken more frequently and the patient will require immediate medical attention. Box 1 outlines what to do if a reaction is suspected.

BOX 1. RESPONDING TO A SUSPECTED TRANSFUSION REACTION

All transfusion reactions need to be managed. If you suspect a reaction:

- Stop the transfusion;
- Take and record the patient's vital signs;
- Seek medical advice immediately and inform the hospital transfusion laboratory.

The key step to treating anaphylaxis is to use the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach (Resuscitation Council (UK), 2008).

A flow diagram for the recognition, initial management and subsequent management and investigations can be found in the British Committee for Standards in Haemotology's *Guideline on the Investigation and Management of Acute Transfusion Reactions* (Tinegate et al, 2012).

BOX 2. **FURTHER RESOURCES**

SHOT has produced advice for staff involved in transfusions:

- *Lessons for Transfusion Laboratory Staff.* tinyurl.com/SHOT-LabLessons
- *Lessons for Clinical Transfusion Staff.* tinyurl.com/SHOT-ClinicalLessons

Minimising transfusion reactions

Some transfusion reactions cannot be foreseen or avoided as antibody levels rise and fall and may not always be detected during the crossmatch process. However, transfusion-associated circulatory overload may be avoided by considering the patient's risk factors, as well as the volume, rate and timing of transfusions.

For example, in patients who are at risk, practitioners can slow down the rate of infusion while ensuring the blood or blood component is transfused within acceptable time limits – that is, no more than four hours after it was removed from the controlled temperature storage. Clinicians should also consider the administration of prescribed diuretics to prevent fluid overload.

Incorrect blood component transfused (IBCT) errors resulting from misidentification and human error are all preventable. These may lead to an acute haemolytic transfusion reaction, which, in some instances, can be fatal. SHOT describes the category of IBCT as:

> *"Episodes where a patient was transfused with a blood component that was intended for another patient, with a component of different type or one which was incorrect in terms of its specification."*

Although some of these incidents occur as a result of laboratory errors, many are due to errors occurring in the clinical area, such as sampling resulting in "wrong blood in tube" and bedside blood administration errors.

Table 1 shows the number of wrong blood components transfused in 2013. Of the 247 reports where patients received an IBCT, a wrong component was transfused in reports, while five were identified before transfusion; in 190 reports, the patient's specific requirements were not met (Bolton-Maggs et al, 2014).

Failure to identify the patient correctly (positive patient identification) is often implicated as a root cause of IBCT errors. Some hospitals have introduced IT systems into clinical areas, often using bar-code wristbands and scanners, to help improve the safety of the final bedside administration procedures.

Most laboratory systems indicate to laboratory staff when different blood groups for the same patient are identified (that is, when the patient's blood group has previously been found to be a different type to the current sample received), or when specific requirements are needed, such as irradiated blood components for patients who are immunocompromised. However, while IT systems can help to alert staff to errors, they do not replace the manual checking process and health professionals should not rely on them to prevent human errors.

Reporting transfusion reactions

All suspected transfusion reactions must be reported immediately to the hospital transfusion laboratory and to a member of the HTT so laboratory investigation and follow-up can begin. It may also be necessary for the HTT member to contact NHSBT to recall other blood components from the same donor.

All adverse events and reactions must be documented in the patient's notes and formally reported via the hospital's local risk management system. They must also be reported to a member of the HTT who will then investigate and if required report to SHOT and/or the MHRA. It is important to understand why the transfusion reaction has occurred to be able to reduce the risk of other reactions in the future.

In 2009, SHOT developed an action plan to improve local and national reporting (Taylor et al, 2010). It recommends:

- Establishing current level of reporting: how does your organisation's reporting record compare with those of similar organisations?
- Give feedback to staff: do you provide/receive feedback after you have submitted a report?
- Focus on learning: has your patient care changed/improved as a result of reporting?
- Engage frontline staff: do you have safety champions on your ward?
- Make it easy to report: who should you report to and how?
- Make reporting matter: the aim of reporting is to improve safety rather than blame individuals.

It can be difficult to categorise a transfusion reaction in the early stages, but it is vital to be aware of all of the possible reactions so appropriate and timely treatment can be given.

All patients should be transfused in clinical areas where they can be directly observed and where practitioners have received up-to-date training on administering blood components and managing patients who have had a transfusion. This includes the emergency administration of anaphylaxis (Tinegate et al, 2012).

Recommendations

The 2009 SHOT report (Taylor et al, 2010) recommends a patient education campaign similar to those used for infection prevention and control. The Do You Know Who I Am? campaign aims to encourage patients receiving a blood transfusion (and other medical interventions) to ask staff "Do you know who I am?" before the intervention was carried out. Please ensure you know who your patient is before you transfuse a blood component. **NT**

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- Patient blood management (1 October)

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Keywords: Blood/Transfusion/Patient blood management/PBM/Evidence

●This article has been double-blind peer reviewed

Patient Blood Management aims to reduce inappropriate transfusions and ensure they are only given where they are clinically indicated

BLOOD TRANSFUSIONS: PART 5 OF 5

Strategies to avoid unnecessary transfusions

In this article...

- An overview of the Patient Blood Management initiative
- Evidence indicating inappropriate use of blood transfusions
- Benefits of PBM for patients who may need a transfusion

Author Jayne Addison is Patient Blood Management practitioner at NHS Blood and Transplant – North West; Rebecca Gerrard is national lead – Patient Blood Management team at NHS Blood and Transplant; Andrea Harris is regional lead, Patient Blood Management team at NHS Blood and Transplant – Midlands and the South West.

Abstract Addison J et al (2014) Blood transfusions 5. Strategies to avoid unnecessary transfusions. *Nursing Times;* 110: 40, 22-25.

The Patient Blood Management initiative is an evidence-based, multidisciplinary approach to improve the care of patients who might need a transfusion of blood or blood components. It is an international initiative in best practice for transfusion medicine.

This final article in our five-part series on blood transfusion outlines the origin and implementation of the Patient Blood Management initiative in England, why it matters, how it works, how it can be put into practice and nurses' role in supporting it.

The Patient Blood Management (PBM) initiative was launched in 2012, from the National Blood Transfusion Committee (NBTC) and NHS Blood and Transplant (NHSBT), with the endorsement of NHS medical director for England Professor Sir Bruce Keogh. Its aim was to build on the success of the Department of Health's (2007; 2002; 1998) Better Blood Transfusion initiatives in England. These came in the form of specific DH objectives to improve the safety of blood transfusion with an action plan for hospitals to implement.

To promote and implement these recommendations, NHSBT had formed multidisciplinary hospital liaison teams in 2003. Their primary role was to work with hospital transfusion teams and practitioners to deliver the Better Blood Transfusion initiatives.

In June 2014, the NBTC PBM recommendations were published with the endorsement of NHS England (NBTC, 2014). The NHSBT hospital liaison teams continue to work with hospital transfusion teams promoting these recommendations, which supersede Better Blood Transfusion.

These transfusion strategies appear to have had a significant impact on the use of red blood cells in England and North Wales; this is evident in the reduced number of units requested by hospitals and supplied by NHSBT (Fig 1). Demand for red cell units increased steadily during the 1990s, then decreased substantially by about 18% between 2002-03 and 2007-08, with a slower but continuing decline since then (Goodnough, 2013). The reasons for these reductions are not entirely clear, but it is likely that they are associated with the following:

- The Better Blood Transfusion initiatives of 1997, 2002 and 2007;
- Better evidence to inform restrictive strategies for red cell transfusion;
- An increase in the price of blood supplied to hospitals by NHSBT (Murphy et al, 2013).

While PBM can be viewed as an

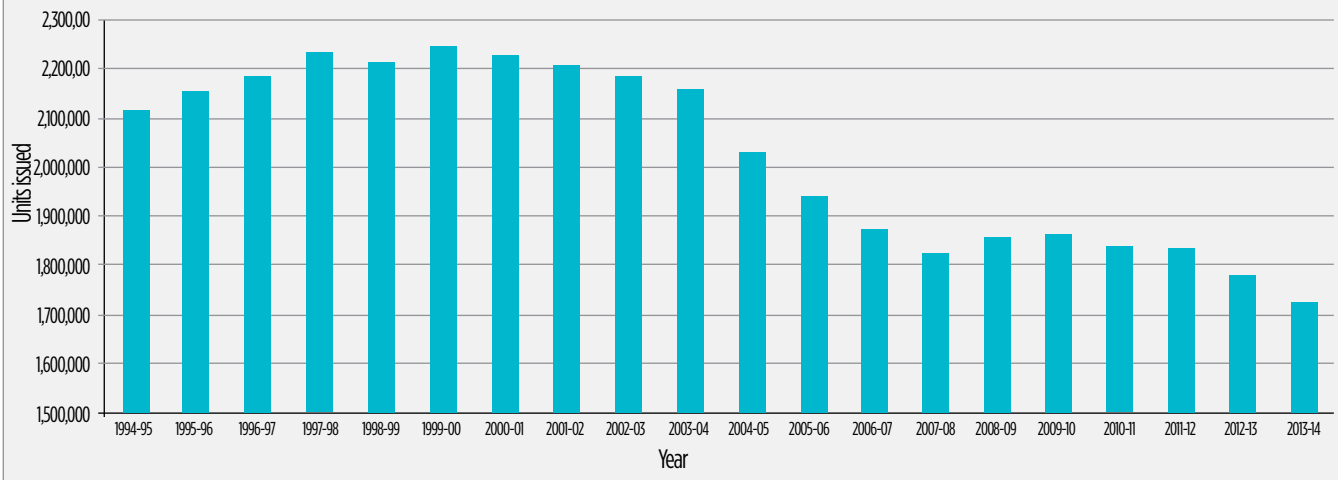
5 key points

1. Patient blood management is an evidence-based, multidisciplinary approach to care for patients who might need a transfusion of blood or blood components
2. PBM reduces complications, and shortens recovery times and hospital stay
3. The most important way to achieve a safe transfusion is to ensure patients receive the right blood
4. Using blood only when needed will save the NHS money
5. Nurses can help ensure patients are at the heart of making decisions about their treatment

Nurses can support patients and carers to make decisions on transfusion

NHS Blood and Transplant

FIG 1. **USE OF RED CELLS FOR TRANSFUSION**



Units issued to hospitals in England and North Wales from NHS Blood and Transplant 1994-2014

extension of Better Blood Transfusion and involves many similar activities, it is not just about safe and appropriate use of blood; it is also about promoting strategies for blood-transfusion avoidance and increasing the use of alternatives. PBM firmly places the patient at the centre of a decision-making process that considers transfusion only when there is clear evidence that it is the best therapeutic treatment available and all other options have been used or systematically considered and excluded.

This move to PBM follows international recognition that it is a successful model (Murphy et al, 2013). It was adopted by the World Health Organization (2010) as a principle to improve transfusion safety, although few programmes have started in Europe to date (Shander et al, 2012; Spahn et al, 2012).

A PBM programme has been established for several years in Australia, where the National Blood Authority has developed guidelines (www.blood.gov.au/pbm-guidelines); the first tertiary hospital to establish a multidisciplinary PBM programme in 2008 showed a decline in rates of transfusion with red cells, platelets and plasma over a three-year period (Table 1) (Leahy et al, 2014).

Why does PBM matter?

When used safely and appropriately, blood transfusion saves and improves patients' lives. Blood transfusion in the UK is safer now than it has ever been but, like all healthcare interventions, it is not risk free.

The risk that a blood transfusion will result in adverse complications is very low. Approximately three million components are issued annually by UK blood services and 2012 data from the UK haemovigilance scheme – Serious Hazards of Transfusion (SHOT) – shows that the risk of death and major morbidity per components transfused is as follows:

- Death – one in 322,570;
- Major morbidity – one in 21,413 (Bolton-Maggs and Cohen, 2013).

QUICK FACT
2.24 to 1.7 million
Reduction in red cell use in England and north Wales between 2000 and 2014

One of the most important ways of achieving a safe transfusion is to ensure patients receive the right blood. Correctly identifying patients at each stage of the transfusion process, by asking them to state their full name and date of birth, will help to reduce the risk of an incorrect blood component being transfused (Hurrell, 2014).

In addition to offering guidance on the correct use of blood when it is needed, PBM advises on measures for blood transfusion avoidance, with improved patient outcomes as a key aim. However, despite hospitals in England and north Wales showing a distinct reduction in red cell use – from 2.24 million units in 2000 to 1.71 million in January 2014 (Fig 1) – national, regional and local audits consistently show that inappropriate use of all blood components is continuing.

The NHSBT National Comparative Audit of Blood Transfusion suggests that, while much good work has been done on reducing unnecessary transfusions, there is still much more to do to ensure all blood components are used appropriately (National Comparative Audit of Blood Transfusion, 2013, 2011, 2009). Table 2 summarises some of the recent national comparative audits of blood component use that highlight inappropriate use.

The focus of PBM on avoidance of blood transfusion has two distinct benefits:

- Improved patient outcomes;
- Lower cost to the NHS.

Improved patient outcomes

Blood transfusions carry risks and are expensive (Goodnough et al, 2013). PBM benefits patients, leading to fewer complications, faster recoveries and shorter stays in hospital (Shander et al, 2012). The assumed benefits of blood transfusion are being challenged by the findings of recent trials that have shown restrictive transfusion practices are equivalent to or better than those that are liberal (Goodnough et al, 2013).

Reduced costs to the NHS

Previous BBT initiatives have been successful. By implementing PBM initiatives, it should be possible to reduce the current

TABLE 1. REDUCTION IN TRANSFUSION RATES

Reduction in blood component transfusion rates in a tertiary hospital in Western Australia, Fremantle Hospital and Health Service, 2008-11

Blood component	Reduction in mean number of units per admission (%)
Red cells	26
Fresh frozen plasma	38
Platelets	16

Source: Leahy et al (2014)

high level of inappropriate blood component use (Table 2) further.

The health service will save money by collecting and using only the blood that patients need. A unit of standard red cells issued from NHSBT to hospitals in 2014-15 costs £121.85; however, potential savings are much greater than the cost of the blood component alone. Reducing associated costs such as of hospital stays, medication, nursing time and equipment as well as all the costs associated with readmissions can amount to huge savings (Kotze et al, 2012).

PBM in practice

In surgical patients, PBM relies on three approaches or "pillars", which:

- Detect and treat perioperative anaemia;
- Minimise blood loss and bleeding intra-operatively;
- Optimise tolerance of anaemia postoperatively (Leahy et al, 2014).

In the medical or intensive care environment, different strategies can be applied to minimise the need for transfusion including:

- Minimising the volume and frequency of blood samples taken from patients to prevent iatrogenic anaemia;
- Using appropriate doses and thresholds for blood components by:
  - Using locally agreed triggers for transfusion based on national guidelines (NBTC, 2013) when requesting blood from the transfusion laboratory and prescribing blood components;
  - Transfusing one unit of one blood component at a time – for example, one unit of red cells or platelets in patients who are not bleeding – and reassessing their condition and in some cases with further blood counts to determine whether transfusion is required;
- Actively managing anaemia – iron-deficiency anaemia can usually be managed with oral iron, or intravenous iron can be used for functional iron deficiency (inadequate iron supply to the bone marrow).

Implementing PBM

Implementation of PBM in hospitals requires several strands of focused activity:

- Analysing the mix of patients and clinical services to determine the main targets for PBM;
- Identifying PBM champions to help educate staff and patients, and promote the PBM initiatives;
- Developing the hospital's transfusion committee.

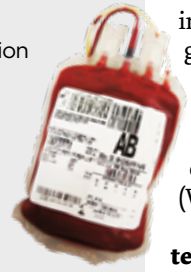
Everyone involved in blood transfusion needs to take responsibility for ensuring that blood components are used safely and appropriately. The successful implementation of PBM needs:

- Leadership and support at every level, including national and regional leaders;
- Hospital management;
- Health professionals to promote measures to increase the uptake of alternatives to transfusion, employ strategies for blood avoidance and reduce the inappropriate use of blood components.

BLOOD TRANSFUSION SERIES

This series, produced by the Patient Blood Management team, comprises five articles:

- Gaining informed consent for blood transfusion (3 September, www.nursingtimes.net/bloodtransfusion)
- Processing, testing and selecting blood components (10 September, www.nursingtimes.net/bloodcomponents)
- Safe administration of blood components (17 September, www.nursingtimes.net/bloodcomponents-admin)
- Managing blood transfusion reactions (24 September, www.nursingtimes.net/trans-react)
- Patient blood management (1 October, www.nursingtimes.net/PBM)



Nurses' role in PBM

"No decision about me, without me" was a key message of the government white paper *Equity and Excellence: Liberating the NHS* (DH, 2010). It further stated that the "vision is for patients and public [to be] at the heart of the NHS".

Both of these statements support PBM initiatives. Nurses have a vital role to play in ensuring that patients are at the heart of decision-making regarding their treatment and that blood components are used safely and appropriately should they be needed.

Nurses should act as patients' advocates and can fulfil this role in several ways:

Challenging inappropriate requests for blood transfusion: challenging requests that fall outside local or national guidelines and are not supported by an overriding clinical decision can reduce the number of transfusions a patient receives or mean transfusion is avoided altogether.

Giving patients the necessary tools: nurses can equip patients with the tools they need to be able to make an informed decision on transfusion and the alternatives. Patients should be involved in their own care wherever possible, and provided with information about the risks, benefits and alternatives to transfusion so they are better informed about their choices and how they can help themselves (for example, by making sure they eat a balanced diet that contains foods rich in iron).

To support this, a series of national patient information leaflets can be downloaded or ordered from NHSBT's Hospitals and Science website (hospital.blood.co.uk). The health professional responsible for making the clinical decision and authorising blood component transfusions should also gain verbal patient consent for blood transfusions and record this in the patient's medical records following guidance from the Advisory Committee on the Safety of Blood Tissues and Organs (2011). Patient information and consent for blood transfusion is discussed further in part one of this series (Whitmore, 2014).

Maintaining transfusion competency: nurses should maintain competency in line with local policy and attend

TABLE 2.
AUDITS ON INAPPROPRIATE BLOOD AND BLOOD COMPONENT TRANSFUSIONS

Blood component	Audit	Data collection year	Key findings
Fresh frozen plasma (FFP)	NCABT (2009)	2008	A total of 4,969 FFP transfusions were audited. There was no documented evidence of bleeding in: ● 43% of adults ● 48% of children ● 62% of infants This indicated potentially inappropriate use of FFP The dose of FFP should be 10-15ml/kg (British Committee for Standards in Haematology, 2009). The dose given was <10ml/kg, and therefore potentially sub-therapeutic, in: ● 40% of adults ● 24% of children ● 20% of infants
Platelets in haematology	NCABT (2011)	2010	3,296 platelet-transfusion episodes were audited; 28% were deemed "outside of platelet transfusion guidelines" and therefore potentially inappropriate
Red cells in adult medical patients	NCABT (2013)	2011	1,592 transfusion episodes involved in an in-depth case review. Of these: ● 13% were deemed to be inappropriately transfused (5% had potentially reversible anaemia) ● 8% were transfused over the national recommended transfusion threshold

NCABT = National Comparative Audit of Blood Transfusion

local and regional transfusion education sessions to support and maintain current, pertinent knowledge.

Patient within PBM

The "P" (patient) in PBM can happen only if patients:

- Are able to participate;
- Know how to be involved;
- Are willing to participate;
- Have been given both the opportunity and the resources to participate.

Conclusion

Several hospitals in England are beginning to build on BBT and formally adopt PBM initiatives; national guidance endorsed by NHS England has recently been published to support this (NBTC, 2014). These PBM recommendations may become part of treatment plans for your patients as the year progresses.

Pilot PBM projects include the active investigation and management of pre-operative anaemia, single-unit transfusion policies and adherence to restrictive transfusion practices.

Nurses should play a significant role in driving the PBM initiative forward and ensuring their patients receive safe and appropriate care and treatment for their condition. **NT**

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For more on this topic go online...

- Patient identification in blood sampling
- **bit.ly/NTBloodSampling**

Keywords: Patient safety/Blood transfusion/Blood samples identification

●This article has been double-blind peer reviewed

Health professionals need to be aware of the importance of patient identification when taking blood samples to reduce adverse events

Patient identification in blood sampling

In this article...

- Guidance on patient identification before transfusion sampling
- Best practice in taking blood samples
- Empowering patients to ensure they are correctly identified

Authors Anne Davidson is patient blood management practitioner at NHS Blood and Transplant; Paula Bolton-Maggs is medical director, Serious Hazards of Transfusion.

Abstract Davidson A, Bolton-Maggs P (2014) Patient identification in blood sampling. *Nursing Times;* 110; 11: 16-17.
The majority of adverse reports relating to blood transfusions result from human error, including misidentification of patients and incorrect labelling of samples. This article outlines best practice in blood sampling for transfusion (but is recommended for all pathology samples) and the role of patient empowerment in improving safety.

Although blood and blood component transfusion is a safe procedure in the UK, the potential consequences of error include death and major morbidity. Both the Serious Hazards of Transfusion (SHOT) haemovigilance scheme and the Medicines and Healthcare products Regulatory Agency (MHRA) state that the majority of adverse events reported to them result from human error, with over 7,000 reported incidents classified as preventable and approximately 1,400 possibly or probably preventable, compared with approximately 3,000 considered to be pathological reactions that may not have been preventable (Bolton-Maggs et al, 2013; Langham, 2013).

Patient identification and blood sampling

National guidelines

Positive patient identification is essential in all aspects of care, but failure to accurately identify patients during blood sampling can lead to a fatal ABO-incompatible transfusion (Bolton-Maggs et al, 2013; British Committee for Standards in Haematology, 2009). The Department of Health (2012) classifies death or severe harm as a result of an ABO-incompatible transfusion as a "never event". For example, if a patient with blood group O received group A red cells, the patient's immune system (with anti-A antibodies) would attack the group A red cells, which could result in haemolysis. This, in turn, could lead to shock, disseminated intravascular coagulation, renal failure or death – even if only a few millilitres were transfused (Tinegate et al, 2012).

"Wrong blood in tube" is used to describe a sample labelled with the wrong patient's details. However, the misspelling of patients' names or illegible writing on the sample tube or request form can also lead to patients receiving incompatible blood.

The severity of this risk led the National Patient Safety Agency (2006) and NHS Quality Improvement Scotland (2006) to stipulate that pre-transfusion blood sampling must only be undertaken by staff who have been trained and competency assessed against specified standards. SHOT – the UK's haemovigilance scheme – also recommends that laboratories adopt a zero-tolerance approach to all samples that do not meet minimum labelling requirements (Bolton-Maggs et al, 2013), which include the patient core identifiers outlined in Box 1.

It is also recommended that the date and time of sampling and the identity of the person taking the sample should be included on the tube and request form. Pre-printed (addressograph) labels are not acceptable on tubes; tube labels should be completed by hand in ballpoint pen, unless "on demand" labels are available and printed only at the bedside (BCSH, 2009).

5 key points

1. The Department of Health classifies death or severe harm as a result of an ABO-incompatible transfusion as a "never event"
2. Pre-transfusion blood sampling must be undertaken by staff who are appropriately trained and competent
3. Laboratories should have a zero-tolerance policy to samples that do not meet minimum labelling requirements
4. Health professionals should use open questions when asking patients to state their identity
5. Patients should be encouraged to ask health professionals "Do you know who I am?"

Many errors occur as a result of incorrect labelling of blood samples

Alamy

BOX 1. **PATIENT CORE IDENTIFIERS**

- First name
- Last name
- Date of birth
- Unique identification number, ideally National Health Service (England and Wales), Community Health Index (Scotland) or Health and Social Care (Northern Ireland) number
- First line of the patient's address (Wales only)
- Gender (Scotland only)

BOX 2. **POSITIVE PATIENT IDENTIFICATION**

- Ask adults and competent children, where possible, to state their full name (first and last name) and date of birth
- Compare this with the patient's identification band (or risk-assessed equivalent); they must match exactly
- Ask a parent or carer (if present) to verify identity if the patient is unable to identify themselves
- Check identity details against the sample request form; they must match exactly
- Investigate all discrepancies before proceeding to take the sample

Patient identification

Before a blood sample is obtained, the patient's identity must be positively checked and confirmed to ensure patient safety. Box 2 highlights the key steps in positive patient identification.

All inpatients must wear a patient identification band (or risk-assessed equivalent), which the NPSA (2007) has stipulated should display only the patient core identifiers. It is recommended these bands are printed directly from the organisation's patient administration system.

Health professionals must ensure that, when asking patients to state their identity, they use open questions and require patients to state their full name without prompting. Patients are often keen to be helpful and answer "yes" without paying full attention, may not be aware of another patient with the same or similar name or may be hard of hearing.

Bedside electronic identification systems using barcode or radiofrequency identification are available in some healthcare facilities, offering improved security and safety by removing elements of potential human error from the process.

In outpatient departments or in the community, patients may not be wearing an identification band. In such cases, patients (or parents/carers) must be asked to state their full name and date of birth, and the details compared with the request form.

The sampling process

The process of collecting and labelling the blood sample must be a continuous uninterrupted event at the patient's (bed)side, with samples labelled immediately by the individual who took the sample.

In response to the potential risk of "wrong blood in tube" events, it is now recommended that a second sample is obtained to confirm the patient's blood group (BCSH, 2013). These samples must be taken on two separate occasions; if there are discrepancies between these results, further samples will be required. Once the patient's blood group has been recorded on the pathology system, only one sample will be required for future transfusions.

Samples used for compatibility testing need to represent the patient's current immune status and are therefore valid for seven days only. Patients who have been transfused or pregnant within the previous three months have a higher risk of developing antibodies, so their samples are only valid for up to three days in advance of the actual transfusion (Box 3).

Patient empowerment

Patient involvement and empowerment are powerful tools in promoting patient safety. As such, NHS Blood and Transplant and SHOT promote a back-to-basics approach, in which patients are encouraged to ask health professionals "Do you know who I am?" Resources for the campaign are available at: tinyurl.com/transfusion-patient.

Patients (or their parents/carers) should also understand what the blood samples are being taken for and, as with all interventions, their consent should be obtained. Valid consent can be defined as:

> *"an ongoing agreement by a person to receive treatment, undergo procedures or participate in research after the risks, benefits and alternatives have been adequately explained to them"* (DH, 2009).

The Nursing and Midwifery Council (2010) states that nurses have a responsibility "to make the care of people their first concern and ensure they gain consent before they begin any treatment or care".

BOX 3. **KEY POINTS**

- Explain the procedure and gain consent from the patient
- All patients having a blood sample taken must be positively identified
- Staff involved in sample collection should be competency assessed
- Never pre-label sample tubes
- Sample tubes must be labelled at the patient's (bed)side by the individual who took the sample
- Pre-printed (addressograph) patient labels must not be used; sample labels should be handwritten or printed using bedside wristband barcode scanning equipment

Summary

Staff involved in any stage of the transfusion process must accept responsibility and accountability for the care of the patient, even if they are not actually authorising or administering the transfusion. To ensure the safety of their patients, health professionals should adhere to the key points in Box 3 when taking blood samples for transfusion.

Although the guidelines to which we have referred focus on blood sampling for blood transfusion, the recommendations for practice are transferable to all types of blood sampling. The National Institute for Health and Care Excellence is developing further guidance on all aspects of transfusion. **NT**

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