

Safe transfusion of blood and blood components

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Summary

Nurses are integral to the blood transfusion process. This article, which forms part of *Nursing Standard's* clinical skills series, outlines the role of the nurse in evidence-based transfusion practice. Patient assessment, preparation, pre-transfusion checks, documentation and adverse reactions are discussed.

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to outline the role of the nurse in evidence-based transfusion practice.

Blood transfusion practice

Blood transfusion practice is the administration of a blood component or plasma-derived product to the patient, relative to the current requirements of national guidelines and laws. Transfusion medicine in hospitals is concerned with ensuring that, at a time when transfusion is clinically indicated, the patient receives the correct blood, safely (Knowles and Poole 2005). The SHOT reports have demonstrated both the infectious and non-infectious risks to which recipients of blood transfusions are exposed (Stainsby *et al* 2006). Errors in practice have given rise to serious and sometimes fatal consequences for patients. Since 1996, seven patients have died as a consequence of receiving the incorrect blood component; a further 15 patients have died probably or possibly because they received the wrong blood, and 94 patients have had major morbidity, for example, required intensive care admission or dialysis treatment for renal failure (Stainsby *et al* 2006). Failure of some aspect of bedside checking procedures, either patient or component related, or of monitoring the patient during the process has been consistently the most common cause of errors (Stainsby *et al* 2006). Transfusion therapy is a relatively safe and often life-saving treatment where the benefits for recipients must be weighed against the risks (Wilkinson and Wilkinson 2001). McClelland and Walsh (2005) recommended that clinicians consider blood transfusion in the same way as a tissue transplant: 'to emphasise that prescribing is not a trivial decision'.

Nurses have a responsibility to provide the highest standard of care and all patients have the right to expect this (Nursing and Midwifery Council (NMC) 2004). Nurses are integral to the transfusion process; they are often involved in pre-transfusion sampling, provision of patient information, requesting blood from the laboratory, collecting blood, administration

THE SERIOUS HAZARDS of Transfusion (SHOT) scheme was established in 1996. SHOT is a confidential reporting scheme for serious adverse transfusion events and reactions, and is endorsed by the 'Better Blood Transfusion' initiatives (Department of Health (DH) 1998, 2002). The data collated by SHOT have been used to inform policies and standards both nationally and locally (Stainsby *et al* 2006), and the Better Blood Transfusion initiatives have encouraged good transfusion practice through the establishment of hospital-based transfusion teams (Box 1). In 2005, two European Union Directives (2002/98/EC, 2004/33/EC) governing the safety and quality of blood were written into UK and Irish law (DH 2005a, 2005b), therefore it seems timely

of the transfusion and monitoring the patient's response, during and after the transfusion event. As practitioners they are personally accountable for their practice and for ensuring that it is based on sound evidence to minimise the risks to which patients are exposed (Wilkinson and Wilkinson 2001). Errors occur in the blood transfusion process and it must be acknowledged that some of these may be associated with inadequate nursing interventions or lack of understanding of the process (Wilkinson and Wilkinson 2001).

Current emphasis in health care requires practice to be evidence based rather than based on ritual or tradition (Parkin and Bullock 2005). Guidelines for practice should reflect best available evidence to ensure clinical effectiveness. For the purposes of this article the authors have used the *Handbook of Transfusion Medicine* (McClelland 2006) and the guidelines published by the British Committee for Standards in Haematology (BCSH *et al* 1999). There is little empirical evidence in these documents but they contain consensus based on clinical expertise. In the absence of scientific research, evidence-based practice should be based on findings of equal importance, that is, clinical expertise (Sackett *et al* 2000, Heddl 2006).

To deliver safe and effective transfusion care, it is important that the practitioner follows a number of key steps.

Patient assessment

Table 1 provides a step-by-step guide to good practice specific to assessing the patient before the administration of blood and blood components. Giving the patient information before a procedure and ascertaining that the patient understands the procedure and has consented to it is the responsibility of the healthcare professionals carrying out the procedure, as well as those prescribing it (DH 2001).

While written consent for transfusion is not, at present, a legal requirement, it is good practice to provide sufficient verbal and written information. This will allow the patient to make an informed choice about whether to undergo the procedure and to discuss any alternative treatment options. Whenever possible, a trained and knowledgeable practitioner should explain the risks, benefits and alternatives, in a way that the patient can understand (DH 2002, National Patient Safety Agency (NPSA) 2006, NHS Quality Improvement Scotland 2006). Consent must be given voluntarily and competent patients are entitled to refuse treatment. In the case of an incapacitated patient, treatment may be given if it is deemed urgent and in the patient's best interests (Hewitt 2005). This would apply

BOX 1

The hospital transfusion team

The role of the hospital transfusion team (HTT) is to promote safe and effective transfusion practice by supporting the implementation of:

- Transfusion education and training.
- Transfusion audit.
- Protocols and guidelines based on national and local evidence of best practice.

Members of the HTT include:

- Transfusion practitioner, for example, registered nurse, biomedical scientist and operating department practitioner.
- Lead consultant, for example, haematologist and anaesthetist.
- Hospital transfusion laboratory manager.

Other members of the hospital team can be co-opted to support specific work programmes, for example, audit practitioner, information technology manager and practice development practitioner.

(Department of Health 2002)

to blood transfusion in an emergency, life-saving situation, if the patient was unconscious and there was no available evidence that the patient had made an advance directive to refuse transfusion. There are situations where individuals may refuse blood transfusion therapy, for example, for religious reasons or anxiety about the related risks. In these circumstances the nurse should refer to local hospital policy for advice.

It is important to allay any fears that patients may have about the procedure and to ensure they have the correct information. Questions that patients might ask before they consent to undergo a procedure such as blood transfusion are shown in Box 2. Murphy *et al* (1997) surveyed patients' attitudes to the amount of information given to them before blood transfusion and found that they would have welcomed more general information about transfusion, mainly because of their concerns about the risks of viral transmission. Interestingly, nearly 40% of patients in the survey thought that written consent should be obtained before blood transfusion (Murphy *et al* 1997).

In 2004, an audit was carried out on the use of the adult patient information leaflet produced by the English National Blood Service for the NHS (Gerrard 2006). The results of the audit showed that although the leaflet is widely distributed, it does not always reach patients before they receive a blood transfusion ($n=60/97$, 62%). If patients are not given

TABLE 1

Good practice in blood transfusion	
Action	Rationale
1. Explain to the patient and where appropriate the family and/or carer the reasons for the transfusion. Provide supporting written information and answer questions in an unbiased manner. Document in the patient's notes.	To ensure that the patient understands the procedure and gives valid consent.
2. Ensure that the patient is wearing a correctly completed identity wristband or locally approved alternative containing as a minimum, name, date of birth, unique identification number. In Wales, an address is required.	To ensure positive patient identification and minimise risk to the patient.
3. Check that the blood component has been prescribed on the correct documentation.	To minimise delay to the patient and avoid wastage of blood.
4. Ensure that all required equipment is available, in date, undamaged and suitable for the procedure.	To minimise delay and risk of infection.
5. Ensure that the cannula intended for administration of the component is patent.	To minimise delay and risk to the patient.
6. Ensure availability of competent and trained staff.	To maximise safety and minimise delay.
7. Provide written documentation with the required minimum patient identifiers to the person collecting the blood component.	To minimise risk of incorrect blood component being collected.
8. On receipt of the blood component confirm that it is for the intended patient.	To maximise patient safety and minimise wastage if an incorrect unit has been collected and is to be returned to the blood bank.
9. Take all equipment and documentation to the patient's side.	To enable correct pre-transfusion checking procedure.
10. Ask the patient (where conscious and able) to state full name and date of birth.	To confirm patient identity.
11. Compare verbal identifiers with identity wristband or alternative.	To confirm positive patient identification.
12. Ensure that the unique patient identification number is included on the wristband and is identical to that on all other patient documentation.	To confirm positive patient identification.
13. Check the blood component expiry date and quality, in particular looking for signs of leakage or deterioration.	To minimise risk to the patient.
14. Check that the details on the label attached to the bag are identical to those of the original bag label, that is, donation number and blood group.	To ensure that the correct compatibility label is attached to the bag.
15. Check that the blood component matches any special requirements identified on the prescription, for example, irradiated.	To ensure that blood meets any special requirements of the patient.
16. Check that verbal details and written patient identifiers on the wristband match those of the blood bag label.	To ensure that the correct blood component is given to the patient.
17. Perform pre-transfusion observations of temperature, pulse and blood pressure and document on the observation chart or transfusion record (local policy).	To establish baseline levels so that any potentially transfusion-related deviations will be recognised.
18. Run the blood component through the blood administration set and commence transfusion at the prescribed rate.	To ensure safety and wellbeing of the patient.
19. Document the start time on the prescription sheet and enter the donation number or affix the adhesive portion of the compatibility where used.	To maintain accurate documentation label and enable traceability.
20. Complete any traceability documentation (paper or electronic) and return to the blood bank as per local policy.	To maintain accurate documentation and enable traceability.
21. Ensure that the patient has a call bell and knows to call for assistance in the event of any potentially transfusion-related symptoms.	To aid early recognition of a transfusion reaction.
22. Maintain visual observation of the patient for the first 15 minutes.	To aid early recognition of a transfusion reaction.
23. Repeat and document observations of temperature, pulse and blood pressure 15 minutes after commencement of transfusion. Maintain additional observations according to local policy.	To aid early recognition of a transfusion reaction.
24. Continue transfusion at the correct rate until completion.	To minimise risk to the patient.
25. If another unit is not required disconnect the giving set on completion and record the stop time.	To maintain accurate documentation.
26. Repeat and document observations of temperature, pulse and blood pressure.	To aid recognition of a transfusion reaction.

information in a timely manner, they cannot make an informed choice. The audit findings recommended the use of good practice guidance for dissemination of patient information leaflets on blood transfusion, which have subsequently been formulated (Gerrard 2006). The guidance is based on having a hospital-wide strategy for informing patients about blood transfusion, educating staff about the need to provide information in a timely manner and raising awareness among patient groups that they have a right to expect information in advance about treatment they may be undergoing. Consideration should also be given to those whose first language is not English, those who have learning difficulties or difficulty with hearing or sight, and children and their parents. All patients should be given information that is appropriate to their needs. Information leaflets for patients, translated into several languages, as well as children's versions, are available from all the UK blood services (www.blood.co.uk/hospitals).

Preparation of patient and equipment

A step-by-step guide to good practice specific to preparing the patient for the administration of blood and components is provided in Table 1. It is important to ensure that the patient is ready to receive the transfusion to avoid delays in commencing the treatment.

Intravenous access Standard intravenous (IV) cannulae are suitable for blood transfusion. The size of the cannula chosen depends on the size of the vein and the speed at which the blood needs to be transfused. Small-bore cannulae such as 19-24 gauge can be used for transfusions that have to be administered slowly, and large-bore cannulae such as 14 gauge for rapid transfusion (McClelland 2006). Multi-lumen central catheters may also be used for blood administration. Where possible one lumen should be designated for administration of blood and blood components.

Administration sets Blood and blood components are administered through a sterile blood administration set with an integral screen filter (170-200µm pore size). It is not necessary to prime the line with 0.9% sodium chloride before transfusion unless the patency of the line needs to be checked. Administration sets range from gravity feed lines to those used with pumps and syringe drivers. These should be changed at least every 12 hours and after completion of the transfusion event (BCSH *et al* 1999). Platelets and plasma components may be administered through a normal blood administration set or through a platelet or cryoprecipitate administration set. Platelets should never be

BOX 2

Frequently asked questions about blood transfusion

- ▶ What is wrong with me?
- ▶ How might a blood transfusion help, what are the benefits?
- ▶ What does it involve?
- ▶ How will it make me feel?
- ▶ What about the risks?
- ▶ Are there any alternatives?
- ▶ What are the risks and benefits of the alternatives?

administered through an administration set that has previously been used for red cell transfusion, as this may cause aggregation and retention of platelets in the line (McClelland 2006).

Infusion devices There are a variety of infusion devices available commercially, which include peristaltic pumps and syringe drivers. Infusion devices should only be used for administration of blood and components if they are verified as suitable for use by the manufacturer and should always be combined with the corresponding administration set (McClelland 2006). They should only be used by staff who have been trained and are deemed competent to do so. It is essential that all devices are maintained and serviced annually or according to local policy.

Blood warmers Blood should only be warmed using a specifically designed commercial device with a visible thermometer and audible alarm, which is used and serviced according to manufacturer's instructions (McClelland 2006). Blood should never be warmed in an uncontrolled way, for example, in a microwave, in hot water or on a radiator.

A blood warmer is indicated in the following circumstances (McClelland 2006):

- ▶ Rapid infusion more than 100ml per minute.
- ▶ Infusion through a central catheter terminating in or near the right atrium.
- ▶ Exchange transfusion in infants.
- ▶ Transfusing patients with significant cold agglutinins (antibodies which agglutinate or clump cells or particles on contact with an antigen).

Medication Drugs should not be added to any blood or blood component pack. Dextrose solution 5%, calcium-containing IV solutions, such as lactated Ringer's solution, and some colloid solutions, may not be compatible with blood components. Administration of these IV fluids in the same giving set before or following a

transfusion should be avoided (Klein and Anstee 2005). The subject of compatible IV fluids and co-administration of drugs and blood transfusion is currently under review by the BCSH Task Force (BCSH *et al* 1999).

Pre-transfusion checks

Blood transfusion is a complex, multi-step process involving staff of different professional backgrounds. Much emphasis is placed on checking procedures at each step, yet errors and omissions occur with consequences that range from little or no clinical significance to fatal (SHOT 2006). In response to such incidents additional checks are sometimes introduced to the process resulting in greater complexity. However, pre-transfusion checks, the final point at which an earlier error could be detected, are essential to minimise transfusion risks. A common sense approach that simplifies the process without compromising patient safety is required.

The number of staff required to perform the checks is one area of disagreement. Traditionally two persons, one of whom must be a registered practitioner (doctor, nurse or midwife) perform the check, but it has been suggested that one person is more reliable than two who may rely on each other to be more rigorous in their checking (BCSH *et al* 1999). There is, however, a dearth of evidence to support this and in some areas a reluctance to abandon the perceived safety of two-person checking, therefore staff are advised to follow local policies and procedures. Watson *et al* (2007), as part of a systematic review of the practical aspects of transfusion, have suggested that where a two-person check is used it is preferable to use independent checking by each person to avoid over reliance on one another. They also recommended that further research to report actual practice and a clinical trial to evaluate the safety and resource implications of one versus two-person checking are required (Watson *et al* 2007).

The way in which staff perform these checks is sometimes questionable. Evidence from SHOT demonstrates that pre-transfusion checks are sometimes undertaken remote from the patient; also that staff pay meticulous attention to checking the component against notes and accompanying paperwork but omit to verify patient details on the component with the details on the wristband and verbally with the patient, usually because the patient is well known to them (Stainsby *et al* 2006).

A national comparative audit of bedside transfusion practice (National Comparative Audit of Blood Transfusion Process Project Group 2005) identified that the absence of patient identity wristbands (or approved alternatives) constituted a risk and supported recommendations from SHOT, the NPSA and the Royal College of Nursing (RCN) that any patient being transfused, whether an inpatient or day case, must wear some form of identification bearing the minimum identifiers of name, birth date and unique identification number. An address may also be required in some parts of the UK (NPSA 2005, RCN 2005, Stainsby *et al* 2006). A badge on a lanyard worn around the neck is one alternative form of identification, and the NPSA has suggested consideration of photographic identification for transfusion-dependent patients (NPSA 2006). The National Comparative Audit of Blood Transfusion Process Project Group (2005) identified deficiencies in peri-transfusion patient observation and documentation.

The step-by-step guide to good practice specific to administration of blood and components and monitoring of the transfused patient outlined in Table 1 and Table 2 does not address standard infection control measures such as hand washing or safe disposal of sharps because all staff should be fully conversant with these issues. Additional information is available in the *Better Blood Transfusion Toolkit*, which can be found on the UK Blood Transfusion and Tissue Transplantation Services website (2006). The NPSA website also provides resources to support competency-based training and education (www.npsa.nhs.uk).

Documentation

Nurses and midwives should always work in accordance with the NMC *Code of Professional Conduct* (2004) and NMC (2005) *Guidelines for Records and Record Keeping*. On completion of transfusion it is essential to ensure that there is an accurate and comprehensive record of the process and outcome of the transfusion episode in the patient's clinical record and care plan (BCSH *et al* 1999). There is also a legal obligation to provide unambiguous evidence of the final fate of the blood or blood component, that is, confirmation of transfusion (including patient's details: name, date of birth and hospital identification number) or its return to the hospital transfusion laboratory un-transfused (DH 2005a, 2005b). This information should be securely recorded for a minimum of 30 years. Accurate documentation is also essential for continuity of care, investigation of a suspected transfusion reaction and to assist in the 'look-

back' of units implicated in transfusion-transmitted infection.

Adverse transfusion events and reactions

Each transfusion carries a small risk of a transfusion reaction and many of these are unpredictable (BCSH *et al* 1999). As highlighted earlier, however, a significant proportion of adverse reactions occur as a result of errors in preparation, ordering, collection or administration of blood (Stainsby *et al* 2006).

The early and prompt detection and appropriate management of a suspected reaction are essential to minimise the escalation of symptoms and may also be life saving. All staff involved in the care of patients receiving transfusions must undergo adequate training in the early identification and management of a transfusion reaction (BCSH *et al* 1999, Stainsby *et al* 2006).

Classification of transfusion reactions can be based on the time of onset, that is, acute or delayed or on their aetiology, that is, immune or non-immune. This section addresses the early

TABLE 2

Good practice in management of an acute transfusion reaction	
Action	Rationale
Mild reaction:	
Stop the transfusion.	To minimise reaction.
Summon urgent medical advice.	Diagnosis of reaction, severity and initial treatment.
Give reassurance to the patient, parents and/or relatives.	To alleviate anxiety.
Confirm patient identification details with patient, the wristband and unit.	To ensure correct unit is being given.
Follow initial medical treatment. It may be decided to recommence the transfusion following appropriate medication. Extra vigilance is required to ensure that this is not the early stages of a more major reaction.	To promote continuity of care.
If the patient responds to treatment record reaction, treatment and outcome in clinical records.	To promote continuity of care. To aid follow-up investigation of transfusion reaction.
If this reaction results in a delay of treatment or an increase in hospital stay, report to the blood bank for onward reporting to the Medicines and Healthcare products Regulatory Agency.	Compliance with the UK Blood Safety and Quality Regulations (DH 2005a, 2005b).
If the patient does not respond to treatment or his or her condition deteriorates follow management of a major reaction.	To minimise reaction.
Major reaction:	
Stop the transfusion.	To minimise reaction.
Summon urgent medical help.	Diagnosis of reaction, severity and initial treatment
Give reassurance to the patient, parents and/or relatives.	To alleviate anxiety.
Check vital signs – temperature, pulse, blood pressure and respirations.	To assess the patient's condition.
Confirm patient identification details with the patient, armband and unit.	To ensure correct unit is being given.
Change giving set and maintain catheter patency with 0.9% sodium chloride.	To ensure no further transfusion of implicated component. To maintain the patency of intravenous access.
Keep the giving set used during transfusion attached to the unit. Seal the end of the giving set with a leur lock bung and follow local policy for sending the unit and giving set to the laboratory.	Unit sent for laboratory analysis.
Contact laboratories for urgent analysis of blood samples – blood bank, haematology, biochemistry and bacteriology.	Early analysis and identification of reaction.
Monitor colour and volume of urine passed. Follow local policy regarding the testing of urine for evidence of haemolysis.	To promote continuity of care.
Maintain close observation of patient and frequent recording of vital signs.	To monitor the patient's condition.

management of an acute reaction. Acute reactions are classified as occurring during the transfusion or up to 24 hours following a transfusion (Stainsby *et al* 2006). While the majority of acute reactions such as acute febrile non-haemolytic reactions and minor allergic reactions are transient and respond to treatment, similarities in early signs and symptoms exist between these minor reactions and major life-threatening reactions. It is important that staff do not confuse the early stages of a major transfusion reaction with those of a more minor one or symptoms of the patient's underlying condition. Therefore, extra vigilance is required when dealing with any unanticipated signs and symptoms during or following a transfusion. Extra vigilance is also required during transfusions of anaesthetised

patients, unconscious patients or patients who are unable to report early symptoms, such as the very young. Signs such as changes in temperature, pulse or blood pressure may not be demonstrated in the anaesthetised patient as a result of anaesthetic agents.

The UK Blood Safety and Quality Regulations placed a legal requirement on all hospitals to report any serious adverse reactions or serious adverse events in relation to the transfusion of blood to the Medicines and Healthcare products Regulatory Agency (MHRA) (DH 2005a, 2005b). Ward staff should report any of these occurrences to the hospital transfusion laboratory for further investigation and reporting. Staff who make reports should use the MHRA Serious Adverse Blood Reactions and Events (SABRE) online system. Serious adverse events include situations where an earlier error is detected and a more serious incident avoided and also incidents where a patient has not been harmed, for example, the patient is given the

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wrong unit but this does not result in an ABO incompatibility. Further advice can be found at www.mhra.gov.uk/

Management of a suspected acute transfusion reaction In the early stages of a suspected reaction it may be impossible to identify the cause of the reaction, therefore initial supportive management should encompass all possible causes. Table 2 provides a step-by-step guide to good practice specific to managing an acute transfusion reaction.

Conclusion

There are five key principles for administration of blood and blood components and these are outlined in Box 3.

Administering the incorrect or wrong blood is the most serious outcome of error during the blood transfusion process (NPSA 2006). Despite the downward trend in ABO-incompatible transfusion errors identified by SHOT over the past two years (Stainsby *et al* 2006), nurses and midwives should ensure that they comply with patient identification procedures to further reduce the risk to patients of receiving the wrong blood with potentially fatal outcomes. Guidelines, competency tools and educational resources exist to support practitioners to deliver safe and effective transfusion. However, it is important when delivering care that nurses apply their professional expertise and judgement in the best interests of the patient (NMC 2004) **NS**

BOX 3

Key principles for transfusion of blood and blood components

Preparedness

Before staff send for the blood it is essential that both they and the patient are prepared. This will minimise risk of wastage.

- ▶ Information should be given to and consent obtained from the patient.
- ▶ Patient access for administration of the component should be checked.
- ▶ Sufficient staff who are trained and competent should be available.
- ▶ The prescription should be correctly completed.
- ▶ All necessary equipment should be available.

Identification checks

Robust patient identification checks minimise the risk of transfusion errors.

- ▶ It is essential to obtain positive patient identification by verbal means wherever possible.
- ▶ The patient must wear written identification (wristband or approved alternative).
- ▶ Verbal identity and unique identification number must be identical on the wristband and all patient documentation.

Component checks

Careful checking of the component against the patient identifiers ensures that the right blood is given to the right patient.

- ▶ Expiry date and visual quality checks are undertaken.
- ▶ Check the component against its accompanying labels and/or documentation and the minimum patient identifiers of name, birth date and unique identification number; all must match.

Observation

Close observation of the patient during and immediately after the transfusion is essential for early recognition of possible adverse effects.

- ▶ Staff must be vigilant to any signs of a potential adverse reaction to the transfusion.
- ▶ Vital signs are recorded before, during and after the transfusion and repeated for each unit.

Documentation

Good record keeping is a mark of the skilled and safe practitioner (NMC 2005). It is essential to maintain documentation of the transfusion episode. This will include:

- ▶ Transfusion start and stop times.
- ▶ Observations (pre, during and post-transfusion).
- ▶ Adverse events or reactions.
- ▶ Dates, times and signatures.