



blood transfusion improvement collaborative

# Appropriate use of Red Cell Transfusion

Guide For Clinical Teams

## Acknowledgements

This user guide was developed by the Blood Transfusion Improvement Collaborative (BTIC) and the Sydney Medical Simulation Centre.

The video was produced by Medical TV Australia.

### **Disclaimer:**

The material in this user Guide has been carefully resourced. It is the intention of the authors to provide evidence based best practice where it exists. The reader is encouraged to seek feedback on their practices and advise from their supervisors regarding local practices in their own institutions. The authors of the User Guide cannot accept responsibility for clinical decisions made by the readers.

### **Blood Transfusion Improvement Collaborative**

During 2002 - 2003 the Institute for Clinical Excellence funded the Northern Centre for Healthcare Improvement from Northern Sydney Health to undertake the NSW Blood Transfusion Improvement Collaborative (BTIC).

The focus of this collaborative was on appropriateness of red cell transfusion. 'Appropriateness' is defined as the balance between risk and benefit to the patient, ideally this is based on the best available evidence. The evidence base for BTIC was founded on the NH&MRC/ ASBT clinical practice guidelines on the use of blood components. The guideline is cognisant that red blood cell transfusion can be life saving, but also carries risks.

The Blood Transfusion Improvement Collaborative used the Institute for Healthcare Improvement Breakthrough Methodology as its approach to reduce inappropriate red cell transfusion.

The aims of the collaborative were:

- To reduce inappropriate use of red cells in elective transfusions in clinically stable patients by 50% in 12 months.
- To improve the appropriate use of red cells in accordance with the recently published NHMRC/ASBT guidelines.
- To promote the spread of successful transfusion practice improvement strategies throughout all hospitals in NSW.

*Contact the BTIC Project office for a full project report.*

## Sponsors

The Blood Transfusions Improvement Collaborative was made possible due to support from the following organisations.



# Appropriate use of Red Cell Transfusion

## Guide For Clinical Teams

Page 1	Aim of educational package
Page 3	Guide for individual users
Page 4	Guide for facilitators
Page 5	Questions for discussion
Page 6	Questions for discussion: answers
Page 17	Summary key learning points
Page 18	Knowledge self checklist
Page 19	References / further reading

## **Aim Of Educational Package**

1. Maximise the appropriate use of blood according to the National Health and Medical Research Council (NHMRC) and Australian Society for Blood Transfusion (ASBT) guidelines for transfusion of red blood cells (RBC).
2. Raise awareness of inappropriate practices surrounding blood transfusions.

## **Learning Objectives**

After watching the video and completing the discussion questions, participants should be able to:

1. State the key principles of the NHMRC / ASBT clinical practice guidelines for the use of RBC's.
2. Identify some of the risks associated with blood transfusion.
3. Outline the steps that should be taken prior to the prescription of RBC's.
4. Outline how to obtain informed consent for blood transfusion.
5. Outline documentation procedures to follow when prescribing blood.
6. Explain specific procedures that exist in your organisation for the prescription and documentation of blood transfusion.
7. Be aware of strategies to use when the transfusion decision is not clear.

## **Rationale**

In recent times the availability of donor blood has diminished substantially, with stores frequently falling to within 1 day of depletion. Studies in Australia have shown that up to 30% of red cells may be transfused inappropriately (Rubin et al, 2001).

This means that appropriate use of the precious resource is not being ensured and that some patients receiving blood are exposed to unnecessary risks.

In 2002 the NHMRC, in conjunction with the ASBT, developed guidelines for the transfusion of blood components. The guidelines outline a set of principles guiding the transfusion decision and the prescription of blood.

## **Development**

“Implementing Guidelines for Blood Transfusion” has been produced by the Blood Transfusion Improvement Collaborative (BTIC) on behalf of NSW Health - Institute for Clinical Excellence. It is part of a broader NSW Health initiative to improve blood transfusion services within Australia.

## **Resources Provided**

- \* Video: “Implementing Guidelines for Blood Transfusion”
- \* Educational Package: Guide for Clinical Teams
- \* Additional resources:
  - NHMRC Pocket Guideline
  - Transfusion: Important Patient Information (Pamphlet)

## **Use Of Educational Package**

Implementing Guidelines for Blood Transfusion was developed for all members of the clinical team including:

- junior and senior medical officers
- registered nurses

## **Methods Of Using Educational Package**

1. Individual Use (Refer to Guide for Individual Users).
2. Facilitated Group Discussion (Refer to Guide for Facilitators).

# Guide For Individual Users

## Time Allocation

### Allow yourself adequate time to:

- View the video (13 minutes).
- Consider the questions (30 minutes).

### Questions For Discussion

- Read through the “Questions for Discussion” before viewing the video.
- Complete the questions after watching the video.
- Check your responses with those provided.
- Complete the Knowledge Self Checklist.

# Guide For Facilitators

## Group Size

An ideal group size is no more than 12 staff members.

## Preparation

### Prior to group meeting (30 minutes):

- Book room with VCR.
- Set up room; ensure that the seating in the room is suitable for both video viewing and small group discussion. A horseshoe arrangement generally works well.
- Photocopy required number of Guides.

## Group Discussion (approximately 1 hour)

### Introduction (10 minutes):

- Explain to participants that they will watch a short video and subsequently consider a set of questions addressing issues in the video.
- Direct them to the “Questions for Discussion” and ask them to consider these before viewing the video.
- Invite them to take notes as they watch the video but inform them that written notes are provided in the answer sheet.

### Watch video (13 minutes).

### Group discussion (30 minutes):

- Work through the ‘Questions for discussion’.
- Summarise the key points at the end of the group.

## Points To Remember

To facilitate effective group discussion try to ensure that:

1. Everyone contributes
2. Comments are directed around the group rather than being relayed through the facilitator.
3. The discussion progresses so that all the objectives are addressed.
4. The facilitator summarises the key points at the end.

## Questions for Discussion

**Q1. What are the key principles regarding the transfusion decision outlined in the video?**

**Q2. Patient groups:**

- What special groups of patients are emphasized in the video?
- How do the NHMRC guidelines apply to them?

**Q3. Transfusion decision:**

- What factors should you take into consideration in addition to haemoglobin (Hb) when making a decision about transfusion?
- What co-morbidities are important?

**Q4. Anaemia:**

- What factors suggest that a patient is not tolerating anaemia?
- Upon examination, what signs suggest that a patient is not tolerating anaemia?

**Q5. What are some of the possible risks of blood transfusion?**

**Q6. In the video, the speakers suggest strategies to use when the transfusion decision is not clear. What are these strategies?**

**Q7. Transfusion Policies:**

- Westmead Hospital blood transfusion services have a policy on the prescription of RBC based on haemoglobin levels. What is the policy?
- Does your hospital employ any strategies to ensure that blood is used appropriately. If not, what strategies could be employed to maximise appropriate use?

**Q8. What is the recommended dose of RBC for a single transfusion episode?**

**Q9. What clinical features are suggestive that a patient has acute hypovolemia secondary to blood loss?**

**Q10. What steps should be taken as part of the prescription of RBCs? What documentation is required?**

**Q11. How do you obtain patient consent for blood transfusion?**

## Questions for Discussion: Answers

### Q1. What are the key principles regarding the transfusion decision outlined in the video?

The NHMRC clinical practice guidelines for the use of blood component therapy, specifically relating to red blood cells, are referred to throughout the video. The guidelines are as follows:

#### CLINICAL PRACTICE GUIDELINES FOR THE USE OF RBCs

1. Blood component therapy should only be given when the expected benefits to the patient are likely to outweigh the potential hazards.
2. The decision to transfuse red blood cells (RBCs) should be based on clinical assessment of the patient and his or her response to any previous transfusion as well as the haemoglobin (Hb) level.
3. Use of RBCs is likely to be inappropriate when Hb > 100 g/L unless there are specific indications. If RBCs are given at this Hb level, reasons should be well documented.
4. Use of RBCs may be appropriate when the Hb is in the range 70-100g/L. In such cases the decision to transfuse should be supported by the need to relieve clinical signs and symptoms and prevent significant morbidity and mortality.
5. Use of RBCs is likely to be appropriate when Hb < 70 g/L. In some patients who are asymptomatic and/or specific therapy is available, lower threshold levels may be acceptable.

Taken from the National Health and Medical Research Council (NHMRC) / Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components (red blood cells, platelets, fresh frozen plasma and cryoprecipitate).

When using these NHMRC guidelines, keep in mind that they state that:

*“They simply provide a list of circumstances under which the use of blood components could be accepted as appropriate therapy”.*

*“The recommendations are not intended to serve as indications for their use, since not all patients who fulfill the criteria would actually benefit from blood component therapy, and in selected cases, such therapy may be appropriate for a patient who does not fulfil the criteria.”*

## **Q2. Patient Groups:**

**\* What special groups of patients are emphasised in the video?**

**\* How do the NHMRC guidelines apply to them?**

### **Applications of NHMRC Guidelines to specific patient groups**

#### **1. Haemodynamically stable adult patients**

##### **- APPLY**

This group is predominantly represented by patients with recent mild to moderate blood loss. This includes controlled intra-operative or post operative bleeding. The guidelines are best applied to this group for two reasons:

- \* there is evidence of inappropriate use.
- \* the physiological response to blood loss and blood replacement is relatively well understood in this circumstance. It is important to note that the “transfusion trigger” is the predicted Hb when the measured Hb and predicted future losses are both taken into account.

\* Chronic anaemia associated with bone marrow suppression - are not well supported. Less is understood of the impact of restrictive transfusion practices in patients with chronic anaemia, especially those with bone marrow suppression.

\* Specialty groups - it is RECOMMENDED THAT THE GUIDELINES BE ADAPTED to meet the needs of specialty groups while maintaining the general principles of the guidelines. For example, obstetric patients, who are generally young, healthy women with normal bone marrow.

#### **2. Acute situations, hypovolemic or acutely bleeding patients**

##### **- DO NOT APPLY**

The guidelines are not applicable to most acute conditions. The “transfusion triggers” presented in the guidelines are not easily applied to this group.

#### **3. Paediatric patients - The guidelines DO NOT APPLY due to lack of evidence in this group.**

Taken from the National Health and Medical Research Council (NHMRC) / Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components.

### **Q3. Transfusion decision:**

**\* What factors should you take into consideration in addition to Hb when making a decision about transfusion?**

**\* What co-morbidities are important?**

The patient's Hb level, although important, should not be the sole deciding factor in starting transfusion. The decision to transfuse should be supported by the need to relieve clinical signs and symptoms and prevent significant morbidity and mortality.

#### **Factors to consider in the transfusion decision**

1. Hb
2. Acute or non-acute situation
3. Patient group (normal bone marrow versus bone marrow suppressed)
4. Ongoing bleeding
5. Patient's acute response to reduced Hb
6. Co-morbidities which influence risk-benefit relationship
7. Complications of transfusions
8. Alternatives to transfusion and steps to minimise ongoing blood loss
9. Capacity to safely care for the patient during a transfusion (monitor, recognise and respond to complications)
10. Patient's wishes

Taken from the National Health and Medical Research Council (NHMRC) / Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components.

#### **Co-morbidity factors to consider in the transfusion decision**

- Patient's cardiopulmonary reserve: if cardiopulmonary function is not normal, it may be necessary to consider transfusing at a higher threshold.
- Atherosclerotic disease: critical arterial stenosis to major organs, particularly the heart, may modify indications for the use of red blood cells.
- Oxygen consumption: this may be affected by a number of factors including fever, anaesthesia and shivering; if increased then the patient's need for red blood cell transfusion could be higher.

Taken from the National Health and Medical Research Council (NHMRC)/Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components.

## **Q4. Anaemia:**

### **\* What factors suggest that a patient is not tolerating anaemia**

#### **Common presenting features in a patient not tolerating a anaemia**

- Chest pain
- Dyspnoea
- Fatigue
- Dizziness
- Hypotension

Taken from Appropriateness of red blood cell transfusions in major urban hospitals and effectiveness of an intervention. MJA Vol 175 October 2001.

### **\* Upon examination, what further signs suggest that a patient is not tolerating anaemia?**

#### **Examination**

- Signs of clinical decompensation secondary to low Hb
- Pale mucous membranes (conjunctival)
- Rapid breathing
- Tachycardia
- Raised JVP
- Heart murmurs
- Ankle oedema
- Postural hypotension
- Altered mental state

Taken from The Clinical Use of Blood: Handbook WHO Blood Transfusion Safety Geneva 2001 p89

## **Q5. What are some of the possible risks of blood transfusion?**

Although Australia's blood supply is very safe, as with all medical procedures, blood transfusion is not risk-free. It is important to realise that the majority of the population have a very poor understanding of risk. An effective way of discussing medical risk with patients is to relate it to the risks of daily activities and to use verbal descriptions such as 'moderate' or 'low' rather than statistics.

Some of the main risks of transfusion are outlined below. In this outline a verbal description of the risk has been given. The quoted occurrence also been given for your own information.

Some of the main risks of blood transfusion are:

- ◆ Minor temporary reactions:
  - mild fever, skin rash or urticaria occur quite commonly (approximately 1-2/100 transfusions).
- ◆ More severe reactions:
  - Bacterial contamination is the most significant infectious complication of transfusion. The chance of receiving a contaminated transfusion is however very low. It has been reported in up to 1 in 80,000 transfusions and is more common in platelet transfusions as platelets are stored at 22°C rather than 40°C as for red cells. It is important to remember that bacterial contamination can equally be present in autologous units.
  - Transfusion related acute lung injury (TRALI) is due to an immune reaction usually caused by white cell antibodies present in the donated units. The risk of TRALI is low with current estimates from 1:5,000 - 1:10,000 transfusions.
  - ABO incompatibility between donor and patient blood types is one of the most serious adverse events following transfusion. Although again the risk is very low, being reported in up to 1:12,000 RBC transfusions, these reactions are preventable. They stem from human error or failure to follow procedures eg: incorrect labelling at the time of specimen collection or inadequate patient identification at the time of transfusion. Williamson et al (1999) reported that 52% of transfusion related deaths occur due to "wrong patient blood".
  - Transfusion transmitted infection. Patients are still most often worried about this complication, however, the risk of transmission of these viruses is negligible.

For patients who are interested in the statistics of incidence, based on available data, the Australian Red Cross Blood Society has estimated the current infection risks for blood transfusions in Australia to be:

- \* HIV - 1 in 4,808,000
- \* Hepatitis C - 1 in 3,112,000
- \* Hepatitis B - 1 in 971,000
- \* HTLV - considerably less than 1 in 1,000,000
- \* Syphilis - considerably less than 1 in 1,000,000

Some patients have also been concerned about variant Creutzfeldt Jacob disease (vCJD) or what is often referred to as Mad Cow disease. In theory, vCJD may be able to be passed on via blood transfusion although no cases after blood transfusion have been reported. As a precautionary measure, blood donations are not accepted from people who have spent six months or more in the United Kingdom between 1980 and 1996.

For patients to put these risks into perspective, it may help to give comparisons with other risks of everyday living (See descriptors below). For example, the chance of being killed in a road accident or an accident at home (about 1 in 40,000) is more likely than almost all of the serious adverse events that may occur due to transfusion.

#### **Description for relative risk**

The terms used are from the Calman Chart as follows:

High :	> 1:100	
Moderate :	1:100- 1: 1000	eg: transmission of chickenpox to contacts
Low :	1:1000- 1:10,000	eg: smoking 10 cigarettes per day
Very low:	1:10,000 - 1: 100, 000	eg: road accident
Minimal:	1: 100,000 - 1: 1,000,000	eg: accident at work
Negligible:	< 1,000,000	eg: accident on railway

Although the risks of transfusion are small it is still important to ensure that wherever possible transfusion is avoided and that blood components are only given when really needed.

**Q6. In the video, the speakers suggest strategies to use when the transfusion decision is not clear. What are these strategies?**

1. Be aware that the absence of evidence does not support transfusion by default.
2. Consult a college, supervisor or blood transfusion services.
3. Ask the patient.

---

**Q.7 Transfusion Policies: Westmead Hospital blood transfusion services have a policy on the prescription of RBC based on haemoglobin levels. What is the policy?**

Haemoglobin Value	WESTMEAD HOSPITAL POLICY
< 70 g/L	Requests for RBC transfusion DO NOT REQUIRE Haematology consultation.
70 - 100 g/L	Requests for RBC transfusion REQUIRE clinical Haematology consultation and approval.
100 g/L	It would be extremely rare to receive a request for RBC transfusion. All such requests REQUIRE Haematology consultation.

**Other cases:** A Haemoglobin value of 80g/L is the transfusion threshold for Haematology and Oncology patients with bone marrow failure or who are undergoing bone marrow suppressive therapy. Transfusion should be used to control anaemia related symptoms.

**Westmead Hospital RBC Transfusion Procedure**

- Two units of blood are reserved at a time.
- Blood is only issued if the request meets the hospital guidelines or has been approved by a haematologist / haematology registrar.
- Further requests for blood may be requested following review of the patient's clinical response to the transfusion.
- Caution: Normovolemic patients, particularly if elderly, may develop pulmonary oedema if blood is transfused too rapidly. These patients should be transfused over several hours. If in doubt, request a Haematology consultation.

**\* Does your hospital employ any strategies to ensure that blood is used appropriately? Does it have a transfusion policy?**

It is strongly recommended that you find out the blood transfusion policy in the facility you are working in. We suggest contacting either the blood bank, the hospital or area health service transfusion committee, medical administration or the haematology department. It is also important for you to know where you can seek advice on transfusion decisions in areas of clinical uncertainty.

---

**Q8. What is the recommended dose of RBC for a single transfusion episode?**

Give 1-2 units to a maximum of 2 units in any single transfusion episode.

---

**Q9. What clinical features are suggestive that a patient has acute hypovolemia secondary to blood loss?**

The clinical features of major haemorrhage are largely determined by:

1. The amount and rate of blood loss and any evidence of occult or concealed bleeding
2. The patient's compensatory responses

**CLINICAL FEATURES OF MAJOR HAEMORRHAGE**

- \_ Thirst
- \_ Tachycardia
- \_ Reduced blood pressure
- \_ Decreased pulse pressure
- \_ Cool, pale sweaty skin
- \_ Increased respiratory rate
- \_ Reduced urine output
- \_ Restlessness or confusion

Taken from The Clinical Use of Blood: Handbook WHO Blood Transfusion Safety Geneva 2001 p88

Note: If a patient presents with any of these signs or symptoms, hypovolemia should be considered. Patients with hypovolemia require resuscitation to be initiated immediately. This may involve RBC transfusion in addition to volume resuscitation. Refer to further reading on back page.

## **Q10. What is the recommended dose of RBC for a single transfusion episode?**

Give 1-2 units to a maximum of 2 units in any single transfusion episode.

### **Q.10 a) What steps should be taken as part of the prescription of RBCs?**

The NHMRC guidelines state that: *“it must be the responsibility of all doctors to ensure that blood component therapy is given only when clearly indicated”*.

Junior Medical Officers should consult appropriately with senior clinicians. Refer to checklist below for further considerations.

#### **Prescribing blood components: checklist for clinicians**

Before prescribing red blood cells, ask yourself the following questions:

1. What improvement in the patient's condition am I aiming to achieve?
2. Can I minimise blood loss to reduce the patient's need for transfusion?
3. Are there any other treatments I should give before making the decision to transfuse?
4. Have cross-matching and any other relevant tests been carried out?
5. What are the specific clinical or laboratory indications for red blood cells for this patient?
6. What are the risks of transmitting infectious agents through the available blood products?
7. Do the benefits of transfusion outweigh the risks for this particular patient?
8. Will a trained person monitor this patient and respond immediately if any acute transfusion reactions occur?
9. Have I recorded my decision to transfuse and reasons for transfusion on the patient's chart and any documentation used in the ordering or administering of blood components?
10. Has the patient been given a clear explanation of the potential risks and benefits of blood component therapy in his or her particular case?
11. Finally, if in doubt, ask yourself the following question: If this blood was for myself or my child, would I accept the transfusion in these circumstances?

Taken from the National Health and Medical Research Council (NHMRC)/Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components.

## **b) What documentation is required?**

Documentation used in ordering or administering blood components (eg: request forms or blood administration forms) and in the patient's medical record should SPECIFY CLINICAL AND LABORATORY INDICATIONS for blood components.

### **Documentation in patient record**

1. Laboratory indications (Hb).
2. Current clinical indications reflecting tolerance of low Hb.
3. Coexisting relevant medical history reflecting risks of untreated anaemia.
4. Reasons for giving blood components if not in accordance with the guidelines (eg: if RBCs are given when the haemoglobin level is >100g/L).
5. Consent.
6. Record of any consultation with other clinicians and or hospital transfusion services.

## **Q11. How do you obtain patient consent for blood transfusion?**

1. Provide each patient with a clear explanation of the reasons why transfusion is being considered, the risks and benefits of transfusion in their particular case and any possible alternatives to transfusion.
2. Patients have the right to decide whether or not they will have the transfusion.
3. Informed consent must be given prior to the transfusion and this must be documented in the clinical notes. In NSW it is Department of Health policy that written consent for transfusion be obtained (refer NSW Health Circular 99/16: Patient Information and Consent for Medical Treatment).
4. In patients (such as those with haematological malignancies) where repeat transfusions are required, it is appropriate to obtain consent for treatment of the condition and to review consent if the condition or treatment plan changes.
5. Provide the patient with written information to assist their understanding. For example: the “Transfusion: Important Patient Information” pamphlet.
6. Some hospitals have a specific form to use to document consent for transfusion.

### **Informed consent checklist**

Before you prescribe a blood transfusion have you?

- Explained
  - Why the transfusion is necessary
  - The possible risks of transfusion
  - What alternatives are available and why they are not being used
- Checked the patient understands the above
- Invited the patient to ask questions
- Asked the patient if they are happy to receive the transfusion
- Obtained written confirmation

## Summary Key Learning Points

- ❑ Blood supplies are critically limited. Up to 30% of transfusions may be inappropriate.
- ❑ Blood transfusion can be associated with complication.
- ❑ Blood is a scarce resource. If it is given to patients who do not meet appropriateness criteria, it is then not available for patients who need it most.
- ❑ The decision to transfuse blood should always be based on careful assessment of clinical and laboratory indications that transfusion is necessary to save life or prevent significant morbidity.
- ❑ The NHMRC /ASBT guidelines provide target haemoglobins as a guide for transfusion decision making. Prescribing decisions should be based on these guidelines, taking the individual patient needs and wishes into account.
- ❑ Responsibility for the decision ultimately rests with individual clinicians. Junior medical officers should consult appropriately with senior staff before prescribing blood.
- ❑ Individual hospitals may have policies requiring clinicians to consult with their transfusion services prior to the prescription of blood.
- ❑ NSW Health requires that patients provide written informed consent prior to the administration of blood.
- ❑ Decisions to transfuse blood must be appropriately documented in the patient record.

Adapted from [The Clinical Use of Blood: Handbook](#) WHO Blood Transfusion Society Geneva 2001 p79.

## Knowledge Self Checklist

*I understand*

	Yes	No	Not Sure
1. The general principles presented in the NHMRC/ ASBT guidelines for the use of blood component therapy as they pertain to RBCs?			
2. How the guidelines apply in different patient groups?			
3. The clinical presentation of a patient who is hypovolemic secondary to blood loss?			
4. The factors which should be incorporated into the transfusion decision?			
5. The clinical presentation of a patient who is acutely compromised by anaemia?			
6. Co-existing clinical conditions which may modify a patient's tolerance of anaemia?			
7. The complications of transfusions?			
8. The steps which should be taken prior to the transfusion being prescribed?			
9. How to obtain informed consent for a blood transfusion?			
10. What needs to be documented in the patient record?			

## References / further reading

1. Australian and New Zealand Society of Blood Transfusion (ANZSBT). Go to: [www.asbt.org.au](http://www.asbt.org.au)
2. Australian Red Cross Blood Service Website. Includes “Information for Medical Professionals”. Go to: [www.arcbs.redcross.org.au](http://www.arcbs.redcross.org.au)
3. National Health and Medical Research Council (NHMRC)/Australasian Society of Blood Transfusion (ASBT) Clinical Practice Guidelines on the Use of Blood Components 2002. [www.nhmrc.gov.au/publications](http://www.nhmrc.gov.au/publications) or copies from AusInfo Government Info Bookshops ph132447 or [www.dcita.gov.au/infoaccess](http://www.dcita.gov.au/infoaccess)
4. Popovsky, M. (2001). “Transfusion Related Acute Lung Injury” (TRALI). Chapter 5 in AABB transfusion reactions.
5. Rubin GL, Schofield WN, Dean MG et al (2001). Appropriateness of red blood cell transfusions in major urban hospitals and effectiveness of an intervention. *Medical Journal of Australia* 175: 354-58
6. The Clinical Use of Blood: Handbook WHO Blood Transfusion Safety 2001. Available for free download from the internet at the following address:  
[http://www.who.int/bct/Main\\_areas\\_of\\_work/Resource\\_Centre/CUB/English/Handbook.pdf](http://www.who.int/bct/Main_areas_of_work/Resource_Centre/CUB/English/Handbook.pdf)
7. World Health Organisation (2001). The Clinical Use of Blood in Medicine, Obstetrics, Paediatrics, Surgery & Anaesthesia, Trauma and Burns. pp 279-299.
8. Williamson, L.M, Lowe, E.M et al (1999). Serious hazards of transfusion (SHOT) initiative: analysis of the first two annual reports. *BMJ*, 1999, 319: 16-19.

CD slip for  
Inside back cover



blood transfusion improvement collaborative

**Appropriate  
use of  
Red Cell  
Transfusion**

Guide For Clinical Teams

**BTIC Project Office**

Northern Centre for Healthcare Improvement  
Level 8, Main Block  
Royal North Shore Hospital  
Pacific Highway  
St Leonards NSW 2065

Tel: (02) 9926 8445

Fax: (02) 9901 3541