A Guide To
Safe Blood Transfusion
Practice

Alternatives to Allogeneic Blood Transfusion

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This Module Is For The Following Staff:

- Biomedical Scientists
- Medical Staff
- Medical Students
- Midwives
- Operating Department Practitioners
- Perfusionists
- Registered Childrens’ Nurses
- Registered Nurses
Contents

• Peri-Operative Strategies
  – Pre-operative strategies
  – Intra-operative strategies
  – Post-operative strategies

• Autologous transfusion techniques:
  – Perioperative cell salvage
  – Postoperative cell salvage
  – Acute normovolaemic haemodilution

• Erythropoietin and Iron Supplementation

• Pharmacological agents to reduce bleeding

• Contingency Planning
Aims & Objectives

Aims:
• To demonstrate an awareness of the different techniques available as alternatives to allogeneic blood transfusion and an awareness of their appropriate use.

• Discuss different autologous transfusion techniques available.

• Identify alternative care strategies to avoid the use of allogeneic blood.

Objectives:
• To develop an awareness of better transfusion practice.

• To promote the appropriate, safe and timely use of transfusion alternatives.
Background

Blood Transfusion is not without risks. Allogeneic (donor) blood is a costly and increasingly limited resource. It is therefore essential that clinicians consider and employ suitable alternative strategies where available and appropriate in order to reduce reliance on donor blood.

Autologous blood is also safer option for patients requiring peri-operative red cell transfusions.

TRANSFUSE ONLY WHEN THE BENEFITS OUTWEIGH THE RISKS
Considerations For Good Practice

- Minimise amount of phlebotomy for lab samples especially in small children
- Base practice on transfusion triggers, targets set by local guidelines, and individual patient assessment.
- Establish target haemoglobin appropriate to the individual patient
Reducing Transfusion Requirements

Pre-operative diagnosis and treatment of anaemia
Patients requiring planned major surgery should have appropriate blood tests for diagnosis and treatment of anaemia e.g. iron deficiency anaemia. Assessment of patient’s previous clinical history e.g. bleeding disorders. Assessment of patient’s current medication - where possible plan to stop medications pre-operatively e.g. anti-coagulant / anti-platelet drugs. This should be instigated as soon as a patient is identified as requiring planned major surgery.

Discuss transfusion alternative options with patients
This should be the case for all patients, not only Jehovah's Witness patients.

Plan for possible intra-operative cell salvage
Intra-operative cell salvage facilities are widely available at all three UHL sites - these techniques can be used in a variety of surgical procedures - individual patients should be assessed for suitability pre-operatively and options discussed with the patient.

Optimum Surgical Blood Ordering Schedule
This is a guidance schedule developed following agreement with surgeons and anaesthetists - it should be used as a guide/tool to indicate how many units to order for different surgical procedures - hospital blood banks may question clinicians if a request differs from the OSBOS.
Reducing Transfusion Requirements

Use of *intra operative cell salvage* – discussed in more detail later.

*Careful positioning* of the patient during surgery - may help reduce blood loss by minimising venous congestion in the operating field.

*Appropriate use of surgical dissecting instruments* - some instruments help to reduce blood loss e.g. diathermy knives, lasers, ultrasonic scalpel etc.

Maintain *normothermia* (unless hypothermia is indicated) - coagulation factors may be less effective at lower temperatures, increasing the risk of blood loss.

*Use of fibrin seals / haemostatic agents / drugs* to help reduce surgical bleeding - discussed in more detail later.

Alternatives to Allogeneic Blood Transfusion

A Guide To Safe Blood Transfusion Practice
Reducing Transfusion Requirements

Post-Operative procedures include:

- Post-operative cell salvage suitable for certain surgical procedures - discussed in more detail later.

- Wherever possible, patients should have Hb checked before making the decision to transfuse in order to prevent unnecessary blood transfusions - predetermined ‘Transfusion Triggers’ may be used, however patients should always be assessed individually taking into account the complete clinical status.
**Autologous Transfusion**

*Autologous transfusion is where the donor and recipient are the same person.*

*There are different types of autologous transfusion including:*

- Intra-operative cell salvage
- Post-operative cell salvage
- Acute normovolaemic haemodilution
Cell Salvage

Suitable surgical procedures where there is a significant risk of blood loss of 1L or more (in adults), intra-operative cell salvage may be usefully employed.
**Intra-Operative Cell Salvage (ICS)**

**ICS – collection & re-infusion of blood aspirated from the operative field during surgery**

- Aspirated blood is collected into a specially prepared anti-coagulant from the surgical site.

- Blood passes into reservoir where it is washed with saline.

- Saline wash fluid is discarded to leave washed, concentrated red cells behind.

- Washed concentrated red cells are then channelled into a re-infusion bag and transfused to patient via transfusion administration set.
Intra-Operative Cell Salvage (ICS)

Advantages:
- Reduction in allogeneic blood usage.
- Life saving where there is uncontrolled bleeding.
- This procedure is accepted by most (but not all) Jehovah’s Witnesses, this must always be checked with individual patient.
- Transfusion of salvaged red cells is safer and more effective than using stored donor red cells.
- Intra-operative cell salvage is cost effective
- Increasingly being used in cancer and obstetric surgery

Disadvantages:
- Decision to use ICS in situations where wound site is infected or contaminated should be made by the clinician in charge on an individual patient basis, giving careful consideration to the risks/benefits of ICS.
- Not suitable for patients with sickle cell disease.
- Only concentrated red cells are returned, any platelets or plasma are washed away, therefore transfusion of allogeneic clotting products may still be required if salvaging large volumes of blood.
Post-Operative Cell Salvage (PCS)

- **PCS** - collection of blood from surgical drains followed by re-infusion - most commonly used to collect blood after release of tourniquet following knee surgery.

- Blood drains into a collection bag through a filter system for a maximum of 6 hours post operation (check local policy) - this blood is then re-infused to the patient.

**Advantages**
- Capital outlay is minimal, no expensive equipment required.
- Minimises use of allogeneic blood.
- Closed system ensures maximum safety for patient and staff.

**Disadvantages**
- The system produces unwashed, whole blood.
- Systems vary but generally blood can only be collected up to 6 hours post operation.
- Allogeneic blood may also be required where blood loss is high.
- Blood recovered may have some haemolysis.
**Erythropoietin (EPO)**

- Erythropoietin is a haemopoietic growth factor.
- It is a cell-line specific stimulator of erythropoiesis i.e., it stimulates the production and maturation of red blood cells.
- It is normally produced by the kidneys, in response to anaemia and tissue hypoxia.
- EPO for therapeutic use is genetically engineered recombinant human erythropoietin (rHuEPO).
- It is more effective if used in conjunction with iron supplementation.

**Uses**

- Treating patients with anaemia secondary to malignant diseases. Some patients with HIV may benefit.
- Treatment of some patients with anaemia of chronic disease
- Treatment of anaemia due to renal failure associated with EPO deficiency.
- May be considered preoperatively to increase haemoglobin level.
- May be considered peri-operatively to avoid the use of allogeneic blood.
- May be considered in the treatment of post-operative anaemia an alternative to transfusion.
Erythropoietin (EPO)

**Advantages:**
- Can almost eliminate use of red cell transfusions in renal failure cases.
- Literature supports use in some groups of patients with malignancy to alleviate anaemia symptoms and reduce need for blood transfusions.
- No transmission of known infections e.g. HIV, hepatitis B and C.
- Cost-effective

**Disadvantages:**
- Iron status needs to be monitored as increased numbers of erythroid cells can lead to acute iron deficiency if iron not given with EPO.
- Increases in blood pressure may occur.
- May increase Hb beyond target if not monitored, with higher risk of thrombosis and possibly increased peri-operative morbidity due to very high haematocrit.
Iron Supplementation

Reducing the need for transfusion:

- Iron deficiency anaemia & iron depletion are a major issue - Health Survey for England 2000
- Approximately 20% of patients referred for planned major surgery have pre-operative anaemia (using WHO parameters).
- Iron supplements are inexpensive compared with red cell transfusion

Manage deficiency appropriately with oral or intravenous iron

Assess iron status in medical and surgical patients
Pharmacological Agents

- To prevent excessive bleeding in surgery
- To treat established bleeding

<table>
<thead>
<tr>
<th>Agent</th>
<th>Use</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrin sealant</td>
<td>Liver and orthopaedic surgery</td>
<td>Thrombin added to fibrinogen concentrates in presence of calcium forms clot of fibrin sealant</td>
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Antifibrinolytics:

1) Tranexamic acid (TXA)
   - Cardiac, Vascular, Liver, Trauma, Orthopaedic (often high risk surgery)
   - Competitive inhibitor of plasmin binding to fibrinogen

2) Epsi-Aminocaproic acid (EACA)
   - Action as for TXA
Key Learning Points

All transfusions carry a risk. Consider:

- “Is this transfusion really necessary?”
- Have all alternative strategies been considered?
- Plan treatment and reduce transfusion requirements.
- When autologous transfusion is used, consider balance of risk.

Efficient preoperative surgical assessment clinics should consider:

- Assessing for anaemia/follow-up of results and correction of anaemia appropriately.
- Recording a full drug and transfusion history.
- Whenever possible and appropriate, stop anti-coagulants and anti-platelet drugs before planned surgery.
- Avoid haemostatic problems by investigating thrombocytopenia and abnormal coagulation problems well in advance of planned surgery.
- Consider and discuss alternatives to transfusion.
Key Learning Points

• Follow UHL guidelines for Transfusion of Red Cells, FFP and Platelets.

• Decision to Transfuse should be based on appropriate laboratory parameters and careful clinical assessment of each patient.

Reduce the need for allogeneic transfusion by modifying transfusion practice.