7.2: Transfusion in critically ill patients

Patients admitted to critical care units often receive blood transfusions but there is increasing evidence of potential harm as well as benefit. Clinical audits show that transfusions of platelets and FFP are often given for indications outside consensus guidelines.

7.2.1: Red cell transfusion in critical care

More than half of all patients admitted to critical care are anaemic and 30% of these have an initial Hb of <90 g/L. Anaemia early after admission is mainly caused by haemorrhage, haemodilution and frequent blood sampling. Later, reduced red cell production due to inflammation becomes an important factor and 80% of patients have an Hb of <90 g/L after 7 days. Around 80% of these transfusions are given to correct a low Hb rather than treat active bleeding. Blood losses from phlebotomy can be reduced by the use of blood conservation sampling devices and paediatric blood sample tubes.

Transfusion management has been strongly influenced by the 1999 Transfusion Requirements In Critical Care (TRICC) study (http://www.ncbi.nlm.nih.gov/pubmed/9971864) which randomised patients to an Hb ‘transfusion trigger’ of 100 g/L (liberal) or 70 g/L (restrictive). There was a trend to lower mortality in patients randomised to a restrictive policy (30% of whom received no transfusions). This was statistically significant in younger patients (<55 years) and those less severely ill. A restrictive transfusion policy was associated with lower rates of new organ failures and acute respiratory distress syndrome. Randomised trials in paediatric critical care, cardiac surgery, elderly patients undergoing ‘high-risk’ hip surgery and gastrointestinal haemorrhage have shown no advantages for a liberal transfusion policy.

A higher transfusion trigger may be beneficial in patients with ischaemic stroke, traumatic brain injury with cerebral ischaemia, acute coronary syndrome (ACS) or in the early stages of severe sepsis. There is no current evidence to support the use of ‘fresh’ rather than stored red cells in critically ill patients or the routine use of erythropoiesis stimulating agents.

The evidence base is reviewed in the 2012 BCSH Guidelines on the Management of Anaemia and Red Cell Transfusion in Adult Critically Ill Patients (https://b-s-h.org.uk/) and the guideline recommendations are summarised in Figure 7.1.

7.2.2: Platelet transfusion in critical care

Moderate thrombocytopenia (>50×10⁹/L) is common in critical care patients, often associated with sepsis or disseminated intravascular coagulation (DIC). ‘Prophylactic’ platelet transfusion in non-bleeding patients is not indicated, although this is the most common reason for transfusion identified in clinical audits (followed by ‘cover’ for invasive procedures). There are no high-quality randomised controlled trials to guide clinical practice and a BCSH guideline is currently in development.
The risk of bleeding in thrombocytopenic patients may be reduced by the avoidance or withdrawal of antiplatelet agents (e.g. aspirin, clopidogrel or non-steroidal anti-inflammatory drugs) and the use of antifibrinolytics such as tranexamic acid. Guidelines based on observational studies and expert opinion are summarised in Table 7.4.

**Figure 7.1 Guidelines for red cell transfusion in critical care (adapted by courtesy of British Committee for Standards in Haematology)**

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**Table 7.4 Suggested indications for platelet transfusion in adult critical care**

- **Severe sepsis**
  - Early (<6h from onset)
    - Target Hb 90–100 g/L if evidence of tissue hypoxia
  - Late (>6h from onset)
    - Target Hb >70 g/L

- **Neuro critical care**
  - TBI and evidence of delayed cerebral ischaemia
    - Target Hb 90 g/L
  - Subarachnoid haemorrhage
    - Target Hb >60–100 g/L

- **Ischaemic heart disease**
  - Patients with ACS
    - Target Hb >80–90 g/L
  - Patient with stable angina
    - Target Hb >70 g/L

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Be less confident using an Hb trigger of 70 g/L if patient is elderly, has significant cardiorespiratory co-morbidities or inadequate tissue oxygenation.

Be more confident using an Hb trigger of 70 g/L if patient is <55 years and/or the severity of illness is relatively low.

ACS – acute coronary syndrome
TBI – traumatic brain injury
### Indication

<table>
<thead>
<tr>
<th>Indication</th>
<th>Transfusion threshold or target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-bleeding patients without severe sepsis or haemostatic abnormalities</td>
<td>Not indicated</td>
</tr>
<tr>
<td>Prophylaxis in non-bleeding patients with severe sepsis or haemostatic abnormalities</td>
<td>Threshold $20 \times 10^9/L$</td>
</tr>
<tr>
<td>DIC with bleeding</td>
<td>Maintain $&gt;50 \times 10^9/L$</td>
</tr>
<tr>
<td>Platelet dysfunction with non-surgically correctable bleeding (e.g. post-cardiopulmonary bypass or potent antiplatelet drugs)</td>
<td>May bleed despite a normal platelet count. Transfusion of one adult therapeutic dose and repeat according to clinical response</td>
</tr>
<tr>
<td>Major haemorrhage and massive transfusion</td>
<td>Maintain $&gt;75 \times 10^9/L$ (&gt;100 $\times 10^9/L$ if multiple trauma or trauma to the central nervous system or inner eye)</td>
</tr>
</tbody>
</table>

### 7.2.3: Plasma component transfusion in critical care

A study of UK critical care units in 2011 showed that 13% of patients received transfusions of FFP. Around 40% of these transfusions were given to non-bleeding patients with normal or only mildly deranged clotting tests and many doses were subtherapeutic. Cryoprecipitate is used as a concentrated source of fibrinogen (fibrinogen concentrate is not yet licensed in the UK for this use). More research is needed to define best practice but the following pragmatic guidelines are suggested:

**Fresh frozen plasma**

- Indicated for the treatment of bleeding in patients with deranged coagulation due to deficiency of multiple clotting factors (e.g. DIC).
- Minimum dose 12–15 mL/kg (equivalent to four units in an average adult).
- Not indicated for prophylaxis in non-bleeding patients with abnormal clotting tests.
- Not indicated for the immediate reversal of warfarin (PCC should be used).
- In liver disease, there is no benefit to FFP transfusions in patients with an INR less than 1.7.

**Cryoprecipitate**

- Adult dose is two pooled units (ten donor units – approximately 3 g fibrinogen).
- Indications include:
  - acute DIC with bleeding and fibrinogen <1.5 g/L
  - severe liver disease with bleeding
  - prophylaxis for surgery when fibrinogen <1.5 g/L
  - hypofibrinogenaemia associated with massive transfusion (maintain >1.5 g/L).