General Surgery - Topic 3 - Blood and blood components

Blood Components and Their Uses

Purpose and Patient Blood Management

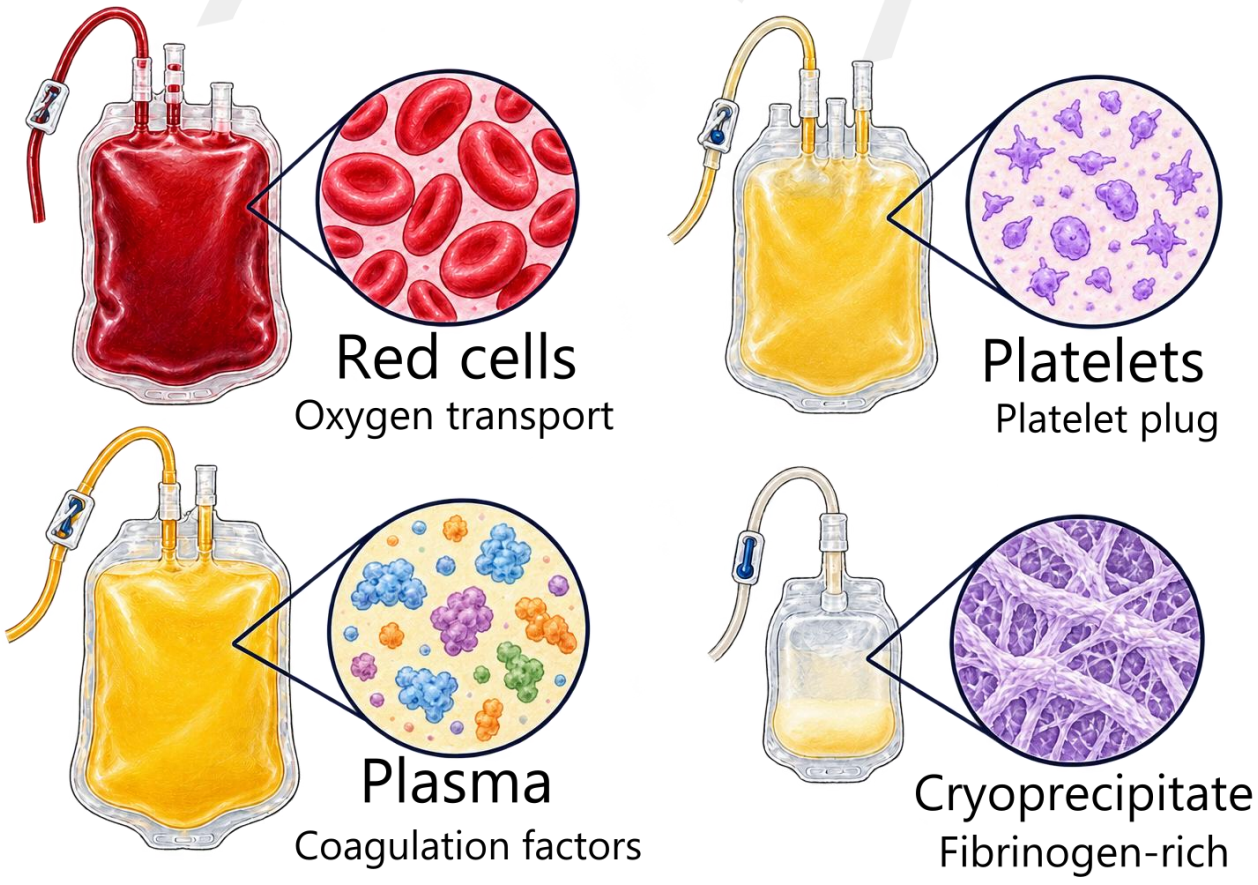
Purpose and Individual Decisions

- Blood transfusion replaces a specific missing function, such as oxygen carriage or haemostasis.
- The decision depends on symptoms, bleeding, physiology and the expected benefit, rather than one laboratory result alone.

Reducing Avoidable Transfusion

- **Patient blood management** reduces avoidable transfusion by treating anaemia, limiting blood loss and supporting safe recovery.
- Before elective surgery, investigate anaemia and treat correctable causes such as iron deficiency when time allows.
- During surgery, careful haemostasis, suitable antifibrinolytic treatment and selected cell salvage can reduce donor-blood exposure.
- Transfusion can be lifesaving, but it does not treat the underlying cause of anaemia or bleeding.

Main Components and Their Uses



Blood components provide different functions; the magnified insets represent their contents or haemostatic roles

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1. Red Cells

Purpose and Thresholds

- Red-cell components increase oxygen-carrying capacity in appropriate patients with anaemia or blood loss.
- They are not the usual treatment for isolated dehydration or low albumin.
- For many haemodynamically stable adults, transfusion is considered when haemoglobin falls below about **7 g/dL**.
- Some cardiac surgical, orthopaedic or cardiovascular-disease settings use a higher threshold after clinical assessment.

Special Situations and Reassessment

- Active major haemorrhage and myocardial ischaemia require their own clinical approach rather than automatic use of the stable-patient threshold.
- For hospitalised adults with acute myocardial infarction, current guidance conditionally supports a more liberal strategy when haemoglobin is below 10 g/dL, with individual assessment.
- In a stable adult without active bleeding, transfuse one unit and reassess the clinical state and haemoglobin before giving another.
- One standard red-cell unit often raises haemoglobin by about 1 g/dL in an average adult, but the response varies with body size and ongoing losses.

2. Platelets

Indications and Procedural Targets

- Platelets help form the primary haemostatic plug.
- They are used for selected patients with significant thrombocytopenia or platelet dysfunction who are bleeding or at relevant procedural risk.
- A threshold near 10×10^9/L is commonly used for prophylaxis in selected non-bleeding patients with reduced platelet production.
- Many major operations require a platelet count above about 50×10^9/L, while selected critical-site procedures require a higher target.

Individualisation and Important Exceptions

- The appropriate threshold also depends on the operation, platelet function, bleeding and the cause of thrombocytopenia.
- Do not apply routine prophylactic transfusion rules to thrombotic thrombocytopenic purpura or heparin-induced thrombocytopenia without specialist advice.
- Life-threatening bleeding may still require exceptional treatment after urgent specialist assessment.

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3. Plasma

Clotting-Factor Replacement

- Plasma provides multiple soluble coagulation factors.
- It may be needed in major haemorrhage or clinically significant bleeding with a relevant coagulation-factor deficiency.

Inappropriate Use and Specific Reversal

- It should not be used simply as a volume expander or to correct a mildly abnormal clotting result in a non-bleeding patient.
- For urgent vitamin K antagonist reversal, prothrombin complex concentrate with vitamin K is generally preferred to plasma when indicated and available.
- Reassess the clinical response and coagulation results after plasma treatment.

4. Cryoprecipitate and Concentrates

Fibrinogen Content and Indications

- Cryoprecipitate is rich in fibrinogen and also contains other proteins, including factor VIII, von Willebrand factor and factor XIII.
- It is used particularly when clinically important bleeding is associated with low fibrinogen.
- Outside major haemorrhage, a fibrinogen level below 1.5 g/L with significant bleeding is a common indication for replacement.

Protocol Targets and Specific Concentrates

- Major haemorrhage uses an agreed protocol with targets adjusted to the clinical setting and laboratory or viscoelastic results.
- Fibrinogen concentrate or specific factor concentrates may be appropriate alternatives in selected settings.
- Specific factor concentrates are generally preferred to non-specific components for many inherited factor deficiencies.

Whole Blood and Special Components

- Whole blood may be used within selected trauma or blood-service protocols, but it is not automatically preferable for every transfusion.

Selected blood-component modifications

Leucocyte reduction	Irradiation	Washing
Reduces febrile and other leucocyte-mediated reactions	Prevents donor lymphocyte proliferation	Removes much of the residual plasma

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1. Leucocyte-Reduced Components

- Leucocyte reduction lowers the risk of febrile non-haemolytic reactions and some leucocyte-mediated complications.
- It does not replace irradiation when prevention of transfusion-associated graft-versus-host disease is required.

2. Irradiated Components

- Irradiation prevents transfusion-associated graft-versus-host disease in patients who need this protection.
- Irradiation prevents viable donor lymphocytes from proliferating in recipients who have a recognised indication.
- It is a specific component modification and does not make blood free of all infectious agents.

3. Washed Components

- Washing removes much of the residual plasma and may be selected for patients with recurrent severe allergic reactions after specialist assessment.
- The transfusion service must advise on availability, storage limits and the precise component required.
- Special component requirements must be communicated to the blood bank before issue.

Compatibility and Safe Administration

Blood Groups and Compatibility Testing

Why Matching Matters

- ABO-incompatible red-cell transfusion can cause rapid intravascular haemolysis, shock, kidney injury and disseminated intravascular coagulation.
- The laboratory identifies ABO and RhD group, screens for clinically important antibodies and performs the required compatibility testing.
- A previous transfusion, pregnancy or documented antibody can influence component selection.
- Tell the blood bank about prior reactions, antibodies and any special product requirements.

Red-Cell and Plasma Compatibility Differ

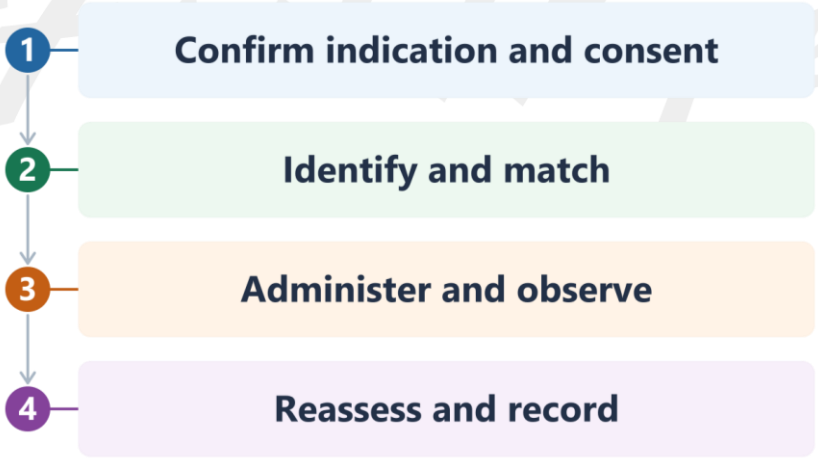
Recipient ABO group	Compatible red-cell ABO groups	Compatible plasma ABO groups
O	O	O, A, B or AB

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Recipient ABO group	Compatible red-cell ABO groups	Compatible plasma ABO groups
A	A or O	A or AB
B	B or O	B or AB
AB	AB, A, B or O	AB

- For red cells, donor red-cell antigens must be compatible with the recipient's antibodies.
- For plasma, the donor's antibodies must be compatible with the recipient's red cells.
- Group O red cells do not make every group O blood product universally compatible.
- In a life-threatening emergency, the blood bank may issue uncrossmatched emergency red cells under an authorised protocol.
- RhD-negative red cells are particularly important for patients at risk from RhD sensitisation, including many females of childbearing potential.
- Selection during shortages or massive haemorrhage requires the blood bank's risk-based policy.

Preparing to Observe or Assist with a Transfusion



1. Before the Component Arrives

Prescription and Consent

- Confirm the indication, prescription, component, dose, rate and any special instructions with the supervising team.
- Explain the expected benefit, main risks and reasonable alternatives, then document valid consent.

Identity and Sampling

- Check the patient's identity using the approved identifiers and label the blood sample at the bedside.
- Never label a sample in advance or use another person's identifiers.

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