# Guidelines

# for Transfusion of

# Blood & Blood Components


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Setting Clinical and Professional Excellence

▪ Transfusion of blood and blood components (ie, RBCs, platelets, plasma, and cryoprecipitate) is one of the most common medical procedures performed.
▪ Transfusion medicine has been improved recently through the development of more sophisticated donor testing: pre-transfusion testing, infectious disease tests, recipient identification and multiple improvements in blood component characteristics and quality (e.g., irradiation, leukoreduction, pathogen inactivation) resulting in minimal risk and improved safety profiles for the transfused components.
▪ The minimum age for donation is 17 years. The minimum body weight for blood donation is 50 kg. The upper age limit for first-time donors is 65 years with no upper age limit for regular donors, although they are subject to annual health review after 65 years of age.
▪ The minimum pre-donation Hb concentration is 125 g/L for female donors and 135 g/L for males. The normal interval between whole blood donations is 16 weeks (minimum 12 weeks) but no more than three donations a year are collected from female donors because of their more precarious iron status.
▪ Donors giving double red cell donations by apheresis must have a pre-donation Hb concentration of 140 g/L and the minimum interval between donations is 26 weeks. Donors can give platelets or plasma by apheresis on a cell separator with a maximum of 24 procedures in 12 months. The minimum interval between donations is 2 weeks and plasma donors are limited to 15 liters a year

**Guidelines for RBC transfusion**

• The decision to transfuse RBCs should be based on a clinical assessment of the patient that weighs the risks associated with transfusion against the anticipated benefit.
• Each unit contains approximately 147- 278 mg of iron, 42.5-80 g of hemoglobin and 128-240 mL of pure red cells, depending on the hemoglobin level of the donor, the collection methodology or further processing.
• One unit of packed RBCs should increase levels of hemoglobin by 1 g/dL (10 g/L) and hematocrit by 3 % in an average sized adult who is not bleeding or hemolyzing.
• Transfused red cells have a half-life of approximately 30 days in the absence of other processes that would result in red cell loss or premature removal.
• Laboratory monitoring of the Hb level is performed to assess the response to transfusion and the need for ongoing blood component support.
• Acute hemorrhage is often classified into four categories (I–IV) depending on the fraction of the normal circulating blood volume lost:
*Class I <15%:* hemorrhage may require no fluid therapy.
*Class II 15 –30%:* hemorrhage may be treated with crystalloid and/or colloid infusion, with red blood cells (RBCs) only rarely required
*Class III 31–40%:* hemorrhage may be treated with crystalloid first, but RBCs should be readily available if there is inadequate response to crystalloid therapy

*Class IV >40%:* hemorrhage requires transfusion of RBCs in addition to maintenance of intravascular volume with crystalloid and/or colloid.

*Indications of transfusion of Packed Red Cells*

● Evidence of rapid blood loss without immediate control

● Patients with acute blood loss ≥ 1,500 mL or ≥30% of blood volume. Elderly patients, or those with comorbid factors, may need transfusion following a blood loss of <30%.

● Patients with anemia:

* hemoglobin level ≤ 7.0 g/dL

* Hemoglobin level 7.0-10 g/dL in patients older than 65 years and those with chronic cardiovascular, cerebrovascular disease, chronic obstructive pulmonary disease or hypoxemia ($PO_2$ < 60mmHg on room air).

For correction of anemia, it is recommended to use a *Restrictive transfusion triggers* in patients who do not have cardiac disease (i.e.to transfuse when hemoglobin is ≤7 g/dL to maintain a hemoglobin level between 7 - 9 g/dL) rather than the use of *Liberal transfusion trigger* (i.e. to transfuse when a hemoglobin level of 9.5 g/dL, with a target level of 11-12 g/dL).

However; in thalassemia, the aim of transfusion is to prevent symptoms and suppress endogeneous erythropoiesis by maintaining hemoglobin at a minimum of 9-11 g/dL.

Also; in sickle cell disease SCD patients with a history of or at high risk for stroke or other severe complications who are on a chronic transfusion protocol or require acute RBC exchange and may be transfused in order to reduce hemoglobin S to <30 -50%.

**Accepted Indications for transfusion in Sickle Cell Disease SCD**:

| **Episodic or Acute Complications** | **Chronic Complications** |
|---|---|
| • Severe anemia<br>• Acute splenic sequestration<br>• Transient red cell aplasia<br>• Preparation for general anesthesia to increase hemoglobin to 10 g/dL to prevent peri-operative complications<br>• Sudden severe illness<br>• Acute chest syndrome<br>• Stroke<br>• Acute multiple organ failure | • Prevention of stroke in children with abnormal trans-cranial Doppler studies<br>• Prevention of stroke recurrence<br>• Chronic debilitating pain<br>• Pulmonary hypertension<br>• Anemia associated with chronic renal failure |

*Blood transfusion should not be*:

♦ Used to treat anemia that can be corrected with a non-transfusion therapy (e.g. iron therapy, folic acid, $B_{12}$)

♦ Used as a source of blood volume, oncotic pressure or to improve wound healing or sense of well-being

**Massive transfusion**: needed in massive hemorrhage which is defined as:

■ Loss of ≥ one blood volume within 24 hours (70 mL/kg, >5 liters in a 70 kg adult)

■ 50% of total blood volume lost in less than 3 hours

■ Bleeding in excess of 150 mL/minute

A pragmatic clinically based definition is bleeding which leads to a systolic blood pressure of less than 90 mm Hg or a heart rate of more than 110 beats per minute.

Clinical and laboratory evaluation of blood counts and coagulation status should be monitored during massive transfusion to guide therapy and combat adverse effects:

- Hypothermia
- Microaggregates of platelets, leucocytes, and fibrin impaired hemostasis
- Citrate toxicity with resulting hypocalcemia & hypomagnesemia
- Left shift of the hemoglobin-oxygen dissociation curve due to depletion of 2,3 diphosphoglycerate (2,3DPG) with altered hemoglobin function.

**Massive Transfusion Guidelines**

| | |
|---|---|
| Measure CBC, biochemistry, acid-base status, electrolytes, albumin, PT INR, aPTT, fibrinogen, D- dimer | |
| If trauma and <3h from injury, give tranexamic acid 1 g bolus over 10 minutes followed by IV infusion of 1gm over 8h (consider tranexamic acid 1gm bolus in non-traumatic) | |
| Until lab results are available: | • Give further FFP 1L (4 units) per 6 units red cells<br>• Consider cryoprecipitate (2 pools)<br>• Consider platelets.1 adult therapeutic dose (ATD) |
| If lab results are available: | • Falling Hb: Red cells<br>• PT ratio >1.5: FFP 15–20 mL/kg<br>• Fibrinogen <150 mg/dL: Cryoprecipitate (2 pools)<br>• Platelets $<75\times10^9$ /L: Platelets. 1 ATD |

**Irradiated red cells**

Irradiated red cells are indicated for patients at risk of transfusion-associated graft-versus-host disease (TA-GvHD ). The component must be irradiated by gamma or X-rays within 14 days of donation and it then has a shelf life of 14 days from irradiation.

**Washed red cells**

Indicated for patients with recurrent or severe allergic or febrile reactions to red cells and severely IgA-deficient patients with anti-IgA antibodies for whom red cells from an IgA- deficient donor are not available. They are produced either manually (24-hour shelf life) or by a closed, automated system in which the red cells are sequentially washed to remove most of the plasma (<0.5 g residual plasma per unit) and then re-suspended in 100 mL SAG-M to provide optimum red cell viability (shelf life 14 days from washing) [*SAG-M* =Sodium Chloride provides isotonicity, Adenine maintains ATP for red cell viability, Glucose supports red cell metabolism, Mannitol helps reduce red cell lysis]

**Guidelines for platelet transfusion**

• At least 7.1 x $10^9$ /L are consumed daily in endothelial support functions.
Platelet count may fall below 50,000 x $10^9$ /L when >1.5–2 blood volumes have been replaced with red cells

• A unit of platelet should contain around $300\times10^9$per unit (range 165–500) platelets per bag in about 50 mL of plasma.

• When possible, the platelet transfusion should be ABO-identical with the recipient, Rh- negative recipients should receive Rh-negative platelets.

• Adult therapeutic dose ATD for platelets comprises:
four units of pooled Random Donor Platelet RDP, 250-400ml (mean 310 ml) or
one unit of Single Donor Platelet by Apheresis SDP, 180-300ml (mean 215 ml) for thrombocytopenia or thrombocytopathy to meet pre- specified triggers.

•Platelets are usually transfused over 30–60 minutes per adult therapeutic dose ATD.

• Measure platelet count or platelet function tests from 10 minutes to 3 hours after transfusion; generally, one ATD (pool of four units derived from whole blood donations or single-donor apheresis unit) typically raises the platelet count by $20 – 40\times10^9$/L, however response to platelet transfusion is adversely affected by the presence of fever, sepsis, splenomegaly, severe bleeding, consumptive coagulopathy, HLA alloimmunization and treatment with certain drugs (e.g. Amphotericin B).

*Indications of platlets transfusion:*

1. Recent (within 24 hours of request) platelet count <10 X $10^9$/L for prophylaxis in stable, non-febrile patient), or <20 X $10^9$/L for prophylaxis in febrile, non- stable patient.
2. Recent (within 24 hours of request) platelet count <50 X $10^9$/L in patient with active hemorrhage, rapidly falling platelet count or planned invasive or surgical procedure.
3. Patient with platelet count < 100 x 109/L in neuro or ocular surgery.
4. Any platelet count in patient with platelet dysfunction and prolonged bleeding time >1.5 X the upper limit of normal with evidence of bleeding or invasive procedure.
5. Reversal of tPA in patient with hemorrhagic transformation of a stroke

*Unacceptable indications for platelet transfusion*

1. Prophylactic transfusion in ITP, TTP/HUS except in life threatening hemorrhage.
2. Extrinsic platelet dysfunction such as renal failure, von Willebrands disease, hyperproteinemia, hyperglobulenemia since the transfused platelets are not better than the patient` own platelets.
3. Heparin-induced thrombocytopenia (HIT) as it can result in acute arterial thrombosis.

**Platelet transfusion thresholds in surgery and invasive procedures**

| Indication | Transfusion threshold or target |
|---|---|
| Most invasive surgery & procedures including post-cardiopulmonary bypass, lumbar puncture, central-line insertion, liver, renal or trans-bronchial biopsy, gastrointestinal endoscopy with biopsy | $50\times10^9$/L |
| Spinal anaesthesia | $50\times10^9$/L |
| Epidural anaesthesia | $80\times10^9$/L |
| Neurosurgery or posterior eye surgery | $100\times10^9$/L |
| DIC with bleeding | Maintain $>50\times10^9$/L |
| Major haemorrhage and massive transfusion | Maintain $>75\times10^9$/L |
| Multiple trauma or trauma to the central nervous system or inner eye | Maintain $>100\times10^9$/L |
| Bone marrow aspiration and trephine biopsy can be performed in patients with severe thrombocytopenia without platelet support if adequate local pressure is applied. | |

**Guidelines for plasma transfusion**

• This component contains adequate levels of all soluble coagulation factors except those provided by platelets.

• Plasma for transfusion must be ABO-compatible with the recipient's red cells.

• Plasma for transfusion is produced from volunteer donation of either whole blood or apheresis plasma and is labeled as fresh frozen plasma (FFP) when frozen within 8 hours of collection or plasma frozen within 24 hours (FP24). Both products are considered clinically equivalent and are typically transfused using a dose of 10-20 mL/kg at a rate of 10–20 mL/kg/hour, although more rapid transfusion may be appropriate when treating coagulopathy in major haemorrhage. The volume of the unit is 250 – 300 mls.

• FFP can be stored for up to 36 months at ≤ –25°C but once thawed; either product must be transfused immediately or be relabeled as "thawed plasma" to allow for refrigerated storage at 4°C for 24 hours. Although degradation of the labile clotting factors V and VIII is observed during refrigerated storage, there is an overall maintenance of coagulation factors at sufficient levels for therapeutic use.

• When used to correct multiple coagulation factor deficiencies, plasma transfusion should be guided by coagulation testing. A prothrombin time (PT) greater than 1.5 times the normal range, an activated partial thromboplastin time (APTT) greater than 1.5 times the normal range, or factor assay less than 25%, can be used as thresholds at which therapeutic or prophylactic replacement may be indicated in the clinical setting.

• When used to correct isolated coagulation factor deficiencies for which no concentrated preparation is available (e.g., factor V, or XI), dosing will depend on the half-life of the specific factor, the pre-transfusion level of the factor, the desired post transfusion level and the duration of raised levels required.

• Laboratory testing must be performed to assess the response to transfusion and the need for ongoing blood component support.

*Indications of plasma transfusion:*

1. Active bleeding or risk of bleeding in the setting of multiple coagulation factor deficiencies (massive transfusion, disseminated intravascular coagulation).
2. Bleeding or prophylaxis of bleeding for a known single coagulation factor deficiency for which no concentrate is available.
3. Emergency reversal of warfarin in a patient with active bleeding in settings where prothrombin complex concentrate with adequate levels of factor VII is not available.
4. Massive transfusion with coagulopathic bleeding (≥ 1 blood volume replacing approximately 5,000 mL)
5. Used as replacement fluid when performing plasma exchange, particularly in the treatment of thrombotic thrombocytopenic purpura.
6. Rare specific plasma protein deficiencies, such as C1-inhibitor, antithrombin III, protein C and protein S deficiencies
7. Might be used to normalize highly elevated international normalized ratio (INR) ≥ 2.0 (≥1.5 for neurosurgical patients) before a planned surgery or invasive procedure.

*Frozen Plasma should not be used for:*

1. Increasing blood volume or albumin concentration
2. Coagulopathy that can be corrected with administration of Vitamin K
3. Nutritional supplementation

**Guidelines for Cryoprecipitated Antihemophilic Factor AHF transfusions**

• Cryoprecipitate is a cold insoluble fraction of FFP and is prepared by thawing one unit of FFP between 1-6° C and recovering the cold insoluble precipitate. The cryoprecipitate is refrozen within 1 hour.

•Thawed cryoprecipitate should be kept at room temperature and transfused as soon as possible after thawing or within 4 hours.

• Cryoprecipitate contains concentrated levels of fibrinogen, Factor XIII, fibronectin, Factor VIII: C & Factor VIII:vWF (von willebrand factor), each unit contain at least 80-100 IU Factor VIII: C and 150-250 mg of fibrinogen in 5-20mL of plasma.

• Use cryoprecipitate that is ABO-compatible with the recipient's red cells, Rh type need not be considered and compatibility testing is unnecessary.

• The frequency of dosing depends on the half-life and recovery of the coagulation factor that is being replaced. When possible, the patient's coagulation parameters should be determined prior to and within 24 hours after transfusion.

In the absence of continued consumption or massive bleeding; one unit of cryoprecipitate will raise the fibrinogen level by 5-10 mg/ dL.

A typical dose is one cryoprecipitate unit per 7-10 kg of body weight or two five-donor pools (ten single-donor units) which will raise fibrinogen concentration by approximately 100 mg/dL in adult, this should be given at a rate of 10–20 mL/kg/h (30–60 min per five-

unit pool) with the goal of maintaining a fibrinogen level of at least 150 mg/dL.
*Indications of cryoprecipitate transfusion:*
1.Dysfibrinogenemia, deficiencies of factor XIII and fibrinogen as in the setting of massive hemorrhage/transfusion or consumptive coagulopathy to maintain fibrinogen >150 mg/dL
2. Hemophilia A or Von Willebrand's disease (vWD) only when appropriate Factor VIII concentrates or Factor VIII concentrates containing FVIII: vWF are not available.
3. Renal failure or certain platelet dysfunctional disorders may also benefit from cryoprecipitate.
4. Severe liver disease with bleeding
5. Prophylaxis for surgery when fibrinogen <150 mg/dL

**Guidelines for granulocytes transfusion**
Because of contaminating red cells, granulocyte components must be ABO and RhD compatible and cross matched with the recipient. They are irradiated before issue to prevent transfusion-associated graft-versus-host disease TA-GvHD.
Daily transfusions are given, with monitoring of response, until recovery.
Mean granulocytes is $1.0 \times 10^9$/pack. The dose is two packs for an adult (10–20 mL/kg for children) and should be used up to midnight on day following collection.
Transfusion of granulocytes (neutrophils – phagocytic white blood cells) may be indicated in patients with life threatening soft tissue or organ infection with bacteria or fungi and low neutrophil counts, usually in the setting of severe, prolonged neutropenia after cytotoxic chemotherapy.

**Human albumin solution HAS**
Contains no clotting factors or blood group antibodies and cross matching is not required. The clinical indications for HAS are controversial. Crystalloid solutions or synthetic colloidal plasma substitutes are alternatives for use as plasma expanders in acute blood or plasma loss. HAS is available in two forms:
▪ *Isotonic solutions* (4.5 and 5.0% in volumes of 50 to 500 mL) which is used
1.to replace subacute plasma volume loss caused by burns, pancreatitis or trauma
2. as a replacement fluid in plasma exchange
▪ *Concentrated solutions* (20% in volumes of 50 and 100 mL) used to:
1. Initiate diuresis in hypoalbuminaemic patients with liver cirrhosis and nephrotic syndrome.
2. Remove large volumes of ascites in patients with portal hypertension.
3. Assist the reduction of high bilirubin levels by exchange transfusion in the newborn (Unconjugated bilirubin binds to albumin).
HAS should *not be used to* 'correct' the low serum albumin level often associated with acute or chronic illness. HAS may cause severe hypersensitivity reactions.

**Prothrombin complex concentrate PCC**

Contains Factors II, VII, IX and X, has replaced FFP as the recommended treatment for rapid reversal of warfarin overdose, with elevated international normalised ratio (InR) and severe bleeding, also it is used to treat bleeding due to the coagulopathy associated with liver disease in view of its superior efficacy, ease of administration and lower risk of severe allergic reactions or fluid overload.

The dose for reversal of warfarin is 25–50 IU/kg.

**Immunoglobulin solutions**

These are manufactured from large pools of donor plasma:

▪ Normal immunoglobulin: contains antibodies to viruses that are common in the population. Intramuscular normal immunoglobulin may be used to protect susceptible contacts against hepatitis A, measles or rubella. High-dose intravenous immunoglobulin is used as replacement therapy in patients with severe immunoglobulin deficiency and in the treatment of autoimmune diseases such as idiopathic thrombocytopenic purpura ITP.

▪ Specific immunoglobulins: made from selected donors with high antibody levels to the target of treatment. Examples include tetanus, hepatitis B and rabies immunoglobulins as well as anti-D immunoglobulin for the prevention of maternal sensitisation in pregnancy.

**Monitoring the patient during transfusion**

Patients should be under regular observation for vital signs pre-transfusion, 15 minutes, 60 minutes and within next 24 hours after start of transfusion.

Wherever possible, intravenous drugs should be administered between transfusions or administered through a second venous access device (or the separate lumen of a multi-lumen central venous catheter). If this is not possible, the transfusion should be temporarily stopped and the line flushed with 0.9% saline before and after administration of the drug.

**Acute transfusion reactions (ATRs)**

Present within 24 hours of transfusion and vary in severity from mild febrile or allergic reactions to life-threatening events. They include:

■ Febrile non-haemolytic transfusion reactions – usually clinically mild

■ Allergic transfusion reactions – ranging from mild urticaria to life-threatening angioedema or anaphylaxis

■ Acute haemolytic transfusion reactions – e.g. ABO incompatibility.

■ Bacterial contamination of blood unit – range from mild pyrexial reactions to rapidly lethal septic shock

■ Transfusion-associated circulatory overload (TACO)

■ Transfusion-related acute lung injury (TRALI)

*If a patient develops new symptoms or signs during a transfusion*:

● Stop the transfusion temporarily and maintain venous access with physiological saline.

● Check vital signs and start resuscitation accordingly.

● Check identification details of the patient and compatibility label of transfused unit.

● Inspect the blood component and transfusion unit for abnormal clumps or discoloration

● Initial treatment of ATR is not dependent on classification but should be directed by symptoms and signs. Immediate management should focus on timely recognition of the event and its severity, based on clinical symptoms and signs, stopping the transfusion and resuscitating the patient. This is followed by appropriate investigation, specific treatment and prevention (where possible) of future events. Treatment of severe reactions should not be delayed until the results of investigations are available

Δ *Mild Reactions*

For patients with mild reactions, such as pyrexia (temperature of ≤ 39°C or rise of 1-2°C from baseline), and/or pruritus or rash but WITHOUT other features, the transfusion may be continued at a slower rate with appropriate treatment and direct observation.

Give antihistamines for patients with mild allergic reactions.

Give oral paracetamol (500-1000 mg) for patients with mild isolated febrile reactions.

Δ *Severe Reactions*

Severe allergic and anaphylactic reactions may occur with all blood components but mostly with plasma-rich components such as platelets or FFP.

If a patient develops sustained febrile symptoms or signs of more severe reactions (temperature ≥39°C OR a rise of ≥2°C from baseline AND/OR systemic symptoms such as chills, rigors, myalgia, nausea or vomiting); bacterial contamination or a haemolytic reaction should be considered.

If a patient being transfused for haemorrhage develops hypotension, careful clinical risk assessment is required. If the hypotension is caused by haemorrhage, continuation of the transfusion may be life-saving. In contrast, if the blood component is considered the most likely cause of hypotension, the transfusion must be stopped or switched to an alternative component and return the implicated blood components units to the laboratory for further investigation.

Anaphylaxis should be treated with intramuscular (IM) adrenaline (epinephrine) 0.5 mL of 1:1000 (0.5 mg). The IM route is rapidly effective and life-saving and prevents delay in attempting to obtain venous access in a shocked patient. It is not contraindicated in patients with coagulopathy or low platelet.

After initial resuscitation, parenteral steroids or antihistamines may be given but these should not be the first-line therapy.

● Laboratory investigations of ATR

Δ Standard investigations including full blood count, renal and liver function tests and assessment of the urine for haemoglobin

Δ For persistent or sever reactions; the implicated units should be returned to the laboratory for repeat compatibility tests, blood culture from the patient and the

transfusion unit, direct antiglobulin test (DAT), lactate dehydrogenase (LDH), haptoglobins and coagulation screen.
Δ Patients who have experienced moderate or severe allergic reactions should have immunoglobulin A (IgA) levels measured.
● Subsequent Management of patients with repeated reactions
Δ *Febrile Non-Haemolytic Transfusion Reactions (FNHTR)* For patients with recurrent febrile reactions; a trial of premedication with oral paracetamol given one hour before the reaction is anticipated or nonsteroidal anti-inflammatory drugs in patients with predominant chills or rigors.
Assessment of the risks of medication against the severity of reaction should be made in each case. Patients who continue to react should have a trial of washed blood components.
Δ *Allergic Reactions* For patients with recurrent moderate or severe allergic reactions, other than those in which the patient is IgA deficient, options for further transfusion include transfusion of washed red cells or platelets with the use of directly monitored transfusion with resuscitation facilities. Consider antihistamine prophylaxis.
Δ *Patients with IgA Deficiency* Patients with known IgA deficiency (IgA <0.07g/l) and no history of reactions to blood must be assessed on an individual basis, taking into account the urgency of transfusion, the indication for IgA testing, the anticipated frequency of transfusion, and history of allergy/anaphylaxis in other settings.
Patients with confirmed IgA deficiency and a history of reaction to blood should be transfused with components from IgA-deficient donors (first choice) or washed red cells (second choice) if time allows.

**Transfusion-related acute lung injury (TRALI)**
Acute lung injury is caused by antibodies in the donor blood reacting with the patient's neutrophils, monocytes or pulmonary endothelium. Inflammatory cells are sequestered in the lungs, causing leakage of plasma into the alveolar spaces (non-cardiogenic pulmonary oedema).
Most cases present within 2 hours of transfusion (maximum 6 hours) with severe breathlessness and cough productive of frothy pink sputum. It is often associated with hypotension (due to loss of plasma volume), fever and rigors and transient peripheral blood neutropenia or monocytopenia.
Chest X-ray shows bilateral nodular shadowing in the lung fields with normal heart size.
TRALI is often confused with acute heart failure due to circulatory overload and treatment with powerful diuretics may increase mortality. Echo study might be needed for differentiation from TRCO.
Treatment is supportive, with high-concentration oxygen therapy and ventilatory support if required. Steroid therapy is not effective

**Transfusion-associated circulatory overload (TACO)**

Defined as acute or worsening pulmonary oedema within 6 hours of transfusion causing acute respiratory distress, tachycardia, raised blood pressure and evidence of positive fluid balance and is considered as the most common cause of transfusion-related death in developed countries.

Elderly patients are at particular risk and predisposing medical conditions include heart failure, renal impairment, low albumin concentration and fluid overload.

The treatment of TACO involves stopping the transfusion and administering oxygen and diuretic therapy with careful monitoring and critical care support if required.

**Hypotensive reactions**

Indicated by an isolated fall in systolic blood pressure of 30 mmHg or more (to <80 mm Hg) during, or within one hour of, transfusion with no evidence of an allergic reaction or haemorrhage.

Most are transient but they occasionally progress to shock and organ dysfunction. The cause of most of these reactions is unknown, although they may be more common in patients taking ACE inhibitors.

Management involves stopping the transfusion and nursing the patient flat with leg elevation (or in the 'recovery position' if consciousness is impaired). Other causes of severe ATR should be excluded by clinical and laboratory investigation.

Patients with recurrent hypotensive reactions may be given a trial of washed blood components.

## Management of Acute Transfusion Reactions

**Mild Reactions:** | **Document in patient`s clinical notes** | **Moderate-Severe**

**Symptoms:**
Mild febrile reaction
• Temperature increase <1.5˚C from baseline
• Stable haemodynamics
• No respiratory distress & no other symptoms
OR
Mild allergic reaction with/out occasional urticarial spots & no other symptoms

**Action:**
1. Check label & recipient identity.
2. Slow transfusion.
3. Consider the need to prescribe paracetamol for pyrexia or antihistamines for urticaria.
5. Continue transfusion at a slower rate with increased monitoring, e.g. TPR/BP at 15-30 minute intervals
6. Send 1 x group & screen (EDTA) tube to blood bank

**If symptoms increase treat as a moderate or severe reaction**

**Adjunct treat. for sever ATR**
depends on cause, clinical state, test results:
• Sepsis likely: broad spectrum antibiotics
• Anaphylaxis/anaphylactoid reaction; depending on severity can include adrenaline IM & antihistamines IV.
• Circulatory overload (TACO): diuretics, O2, positive airway pressure.
• Acute lung injury (TRALI): respiratory support.
• Rec. severe allergic reactions: washed cellular components.
• Acute hemolysis: maintain BP, force diuresis and alkalinize urine.

**Symptoms:**
• Fever ≥1.5˚C from baseline with or without rigors / chills
• Unexpected tachycardia or change in blood pressure
• Acute breathlessness, desaturation, wheeze, stridor or cyanosis
• Facial, pharyngeal or laryngeal oedema
• Extensive erythematous or urticarial rash
• Acute pain up transfusion arm
• Chest or loin pain
• Severe apprehension
• JVP acutely elevated
• Onset of crepitations in lung
• Haemoglobinuria

**Action:**
• Stop transfusion.
• Maintain ABC and monitor vital signs
• Check label and recipient identity
• Replace infusion set; administer saline to keep vein open.
• Obtain specimens based on clinical signs/symptoms (collect away from site of cannula):
• Blood group serology: 1 x group & screen (EDTA) tube: send ASAP to blood bank + infusion set + attached blood bag (sealed in a plastic bag).
• If haemolysis suspected: send full blood count, blood film, coagulation screen; U&E, haptoglobin, bilirubin, LDH, urinalysis.
• If sepsis is suspected: send blood cultures.
• If respiratory distress: send blood gases.

*www.nzblood.co.nz/assets/Transfusion-Medicine/PDFs/Transfusion-related-Adverse-Reaction-Notification-Form-111F009.pdf*

| **Management of Sever Acute Transfusion Reactions** | |
|---|---|
| Symptoms | Management |
| Fever<br>(>2°C rise or >39°C)<br>and/or<br>chills, rigors,<br>myalgia, nausea or<br>vomiting and/or<br>loin pain | Standard investigations<br>Samples for repeat compatibility testing, direct antiglobulin test (DAT ), lactate dehydrogenase (LDH) and haptoglobins<br>Blood cultures from patient<br>Coagulation screen<br>Do not discard implicated unit<br>If febrile reaction sustained: return blood component to laboratory, repeat serological investigations (compatibility testing, antibody screen and DAT), measure haptoglobins and culture blood component. |
| Mucosal swelling<br>(angioedema) | Standard investigation<br>Measure IgA level – if <0.07g/L (in absence of generalised hypogammaglobulinaemia) perform confirmatory test with sensitive method and check for IgA antibodies |
| Dyspnoea, wheeze or<br>features of<br>anaphylaxis | Standard investigationsa<br>Check $O_2$ saturation or blood gases<br>Chest X-ray. Echo Study<br>If severe or moderate allergic reaction suspected, measure IgA level (as above) |
| Hypotension (isolated<br>fall in systolic<br>blood pressure of<br>>30 mm Hg<br>resulting in a level<br><80 mm Hg) | Standard investigations plus investigations as for fever<br>If allergic reaction suspected measure IgA level (as above)<br>If severe allergic/anaphylactic reaction suspected,<br>consider measurement of serial mast cell tryptase |
| Standard investigations:<br>full blood count, renal and liver function tests, assessment of urine for Hb | |
| *BCSH Guideline on the Investigation and Management of AcuteTransfusion Reactions, 2012* | |

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