

MAJOR HAEMORRHAGE, BLOOD PRODUCTS, AND TRANSFUSION REACTIONS PATHWAY

Protocol 49: Recognition, Major-Haemorrhage Activation, Haemorrhage Control, Damage-Control Resuscitation, Blood-Product Administration, Anticoagulant Reversal, Transfusion-Reaction Management, and Safe Handover

DRAFT FOR EMERGENCY MEDICINE, TRAUMA, SURGERY, OBSTETRICS, ANAESTHESIA, CRITICAL CARE, INTERNAL MEDICINE, PAEDIATRICS, HAEMATOLOGY, TRANSFUSION LABORATORY / BLOOD BANK, PHARMACY, NURSING, AMBULANCE / TRANSFER SERVICES, AND CLINICAL GOVERNANCE

STATUS: This is a draft clinical-governance document. It must be adapted to local blood-bank inventory, component specifications, emergency-release policy, transport times, haemorrhage-control capability, anticoagulant-reversal formulary, paediatric and obstetric pathways, laboratory / viscoelastic testing, and national haemovigilance requirements before approval.

BLOOD SAFETY RULE: Control the source, activate early, identify the patient correctly, communicate continuously with the transfusion laboratory, warm the patient and products, give balanced haemostatic resuscitation, monitor calcium and coagulation, and stop any transfusion immediately when a serious reaction is suspected.

Document control	Details
Document owner	Emergency Department / Medical Services Directorate / Transfusion Committee / Blood Bank / Nursing Services / Clinical Governance
Clinical leads	Emergency Medicine; Trauma / Surgery; Obstetrics; Anaesthesia; Critical Care; Internal Medicine; Paediatrics; Haematology / Transfusion Medicine; Laboratory; Pharmacy; Nursing; Ambulance / Transfer Services
Applies to	Children, adolescents, pregnant and postpartum patients, and adults with active or suspected major bleeding, or receiving blood components in or through the Emergency Department.
Interfaces	Protocols 1-8; Protocol 25 Gastrointestinal Bleeding; Protocols 31-36 Trauma; Protocol 38 Obstetric Emergencies; Protocol 45 Sickle Cell Emergencies; Protocol 46 Oncology Emergencies; Protocol 48 Emergency Airway; Protocol 57 Downtime.
Version / status	Draft 1.0 for local multidisciplinary validation
Approval date / review	Approval: _____ Review: _____ Earlier review after serious incident, blood-product change, new reversal agent, or national guidance update.
Supersedes	New protocol / local documents to be reconciled before approval.

1. Purpose

To provide a standardized emergency-department pathway for rapid recognition and control of life-threatening haemorrhage; timely activation and deactivation of the major haemorrhage protocol; safe emergency release and administration of blood components; correction of coagulopathy, hypothermia, acidosis and hypocalcaemia; reversal of anticoagulants; recognition and treatment of transfusion reactions; and safe admission, transfer, follow-up and governance.

2. Scope

- Applies from triage or pre-arrival notification through resuscitation, haemorrhage control, operating theatre / interventional radiology / obstetric or endoscopic care, critical-care admission, inter-facility transfer, or end-of-life care.
- Includes traumatic, obstetric, gastrointestinal, surgical, vascular, gynaecological, paediatric, medical and anticoagulant-associated bleeding, and acute reactions to red cells, plasma, platelets, cryoprecipitate, fibrinogen products and whole blood where locally used.
- Does not replace source-specific pathways or specialist judgement. Definitive haemorrhage control must occur in parallel with resuscitation; blood products are not a substitute for surgery, interventional radiology, endoscopy, uterotonic / obstetric intervention or external compression.
- All product selection, compatibility, storage, issue, traceability and reaction investigation must follow the licensed blood bank / transfusion service and national regulatory requirements.

3. Core policy statements

- Major haemorrhage is a clinical diagnosis. Activate from physiology, observed or suspected blood loss, bleeding site, anticoagulant exposure and response to initial resuscitation; do not wait for haemoglobin, a scoring tool or profound hypotension.
- Source control is the priority. Apply direct pressure, haemostatic dressings, tourniquet, pelvic binder or uterine measures as indicated and mobilize surgery, obstetrics, endoscopy, interventional radiology or transfer immediately.
- Use one named clinical lead and one named transfusion-laboratory communicator. The major-haemorrhage call must state patient identifiers, location, age / weight, clinical context, urgency, products required, special requirements and destination.
- Use emergency-release blood when delay for compatibility testing is more dangerous than transfusion. Transition to group-specific and then fully compatible products as soon as the transfusion laboratory advises.
- Use a fixed-ratio blood-component strategy during uncontrolled bleeding when indicated, then move to laboratory- or viscoelastic-guided targeted therapy at the earliest opportunity. Avoid excessive crystalloid.
- Prevent the lethal spiral of bleeding, coagulopathy, hypothermia, acidosis and hypocalcaemia. Warm the patient, fluids and products; monitor ionized calcium and replace calcium according to the approved major-haemorrhage chart.

7. Give tranexamic acid promptly when indicated for major trauma or postpartum haemorrhage and within the evidence-based time window. It is not a universal treatment for every bleeding presentation.
8. Rapidly identify and reverse clinically important anticoagulation in life-threatening bleeding using the approved reversal chart and specialist advice. Do not delay source control or blood support while waiting for drug levels when the history and timing establish significant exposure.
9. Every blood component requires positive patient identification, bedside compatibility checks, baseline and interval observations, traceability and immediate access to reaction management. Emergency does not remove the requirement to identify the correct patient and correct unit.
10. At the first sign of a potentially serious transfusion reaction, stop the transfusion, maintain IV access with new tubing and 0.9% sodium chloride, assess ABCDE, recheck identity, call senior help and notify the transfusion laboratory. Do not discard the unit or giving set.
11. TACO risk must be assessed before non-emergency transfusion. Use the minimum effective dose, single-unit reassessment where appropriate, slower rates and diuretic planning only when clinically indicated.
12. Deactivation is an active clinical and laboratory decision. Reconcile all issued, transfused, returned and wasted products; communicate ongoing needs; document complications; and complete haemovigilance and incident reporting.

4. Definitions and clinical framework

Term	Operational meaning
Major haemorrhage	Active or suspected bleeding causing or likely to cause shock, ongoing transfusion requirement, critical-site compromise, rapid blood loss, or need for immediate haemorrhage-control intervention. Local activation criteria must be explicit.
Critical bleeding	Life-threatening bleeding with haemodynamic instability, critical-site bleeding, or major blood-product requirement, regardless of whether a numerical massive-transfusion threshold has yet been reached.
Major haemorrhage protocol (MHP)	A coordinated clinical and laboratory response that releases predefined emergency blood packs, mobilizes staff and haemorrhage control, standardizes monitoring and communication, and supports rapid transition to targeted therapy.
Damage-control resuscitation	Early haemorrhage control, restricted crystalloid, haemostatic blood-product support, prevention of hypothermia and hypocalcaemia, and avoidance of unnecessary blood-pressure normalization before control, except where organ perfusion requires a higher target.
Emergency-release blood	Blood issued before completion of full compatibility testing under a documented emergency process. The clinician accepts the immediate compatibility risk because delay threatens life.
Balanced resuscitation	Empiric red-cell and plasma replacement in an approved ratio, with early platelet and fibrinogen support as indicated, until laboratory / viscoelastic results can guide treatment.
Transfusion reaction	Any new sign, symptom, deterioration or laboratory abnormality temporally associated with transfusion, including haemolysis, allergy / anaphylaxis, sepsis, fever, TACO, TRALI, hypotension and metabolic complications.
TACO	Acute or worsening respiratory compromise and/or pulmonary oedema during or within 12 hours of transfusion, with evidence supporting circulatory overload.
TRALI	Acute hypoxaemic respiratory failure with bilateral pulmonary oedema temporally related to transfusion, without circulatory overload as the primary explanation. Treat as a clinical emergency and notify the transfusion laboratory.
Haemovigilance	The system for identifying, investigating, reporting and learning from transfusion-related incidents, reactions, near misses and product defects.

5. Roles and accountability

Role	Minimum responsibility
Clinical / resuscitation lead	Recognize haemorrhage, activate MHP, define physiological targets, direct C-ABCDE resuscitation, prioritize source control, approve transition and deactivation, and lead handover.
Haemorrhage-control lead	Perform or mobilize definitive control: surgery, obstetrics, endoscopy, interventional radiology, vascular / ENT / urology, external compression or transfer.
Transfusion-laboratory communicator	Maintain one clear line with blood bank; transmit identifiers, urgency and product needs; relay compatibility / inventory issues; document requests, pack numbers and deactivation.
Transfusion laboratory / blood bank	Prioritize testing, issue emergency and compatible components, advise on antibodies and special requirements, track inventory, support reaction investigation and arrange regional supply when needed.
Medication / blood nurse	Establish access, verify products and patient, use approved warmer / infuser, administer TXA, calcium and reversal agents, monitor observations and reactions, and maintain product traceability.
Recorder / runner	Record times, physiology, products, medicines, laboratory results, estimated blood loss, communications, destination and unused-product return; obtain and transport specimens / products safely.
Haematology / transfusion medicine	Advise on coagulopathy, complex antibodies, refractory bleeding, reversal, reaction investigation, sickle cell disease, rare components and future transfusion planning.
Transfer team	Confirm haemorrhage control plan, products / medicines, monitoring, warming, oxygen, escort competence, blood-bank communication and receiving-team acceptance before departure.

6. Required readiness

Resource	Required local standard
Activation and communication	One-call MHP activation, dedicated blood-bank number, backup communication during IT / telephone downtime, pack labels, activation form and explicit deactivation process.
Blood availability	Defined emergency group O red cells, plasma, platelets, cryoprecipitate / fibrinogen concentrate and, if used, low-titre group O whole blood; monitored storage, transport boxes and regional resupply plan.
Equipment	Rapid infuser where available, approved blood warmer, pressure devices, large-bore IV / IO access, ultrasound, haemorrhage-control equipment, calibrated scales / suction measurement and point-of-care testing.
Monitoring	Continuous ECG and SpO ₂ , frequent or invasive blood pressure, temperature, urine output, serial blood gases, ionized calcium, lactate, FBC, PT / INR, APTT, fibrinogen and viscoelastic testing where available.
Medicines	Tranexamic acid, calcium, vitamin K, four-factor PCC, protamine, DOAC-specific reversal agents where approved, uterotonics and emergency anaphylaxis / sepsis medicines, with standardized dosing charts.
Competence	Staff trained in MHP activation, product checks, emergency release, blood warmer / infuser use, reaction recognition, paediatric weight-based transfusion, obstetric haemorrhage and debrief / incident reporting.

7. Triage and immediate danger recognition

Finding	Immediate response
Uncontrolled external bleeding, traumatic amputation, penetrating torso / junctional injury or expanding haematoma	Direct pressure / haemostatic dressing; tourniquet for life-threatening limb bleeding; resuscitation area; activate trauma and MHP; immediate operative / transfer pathway.
Shock with suspected internal bleeding	C-ABCDE; activate MHP from physiology and response; two large-bore IVs or IO; blood sampling; emergency blood if required; urgent source-control imaging only if it does not delay intervention.
Postpartum bleeding, uterine atony, retained placenta or concealed obstetric haemorrhage	Activate obstetric haemorrhage pathway and MHP; uterine measures / uterotonics, TXA when indicated, obstetric / anaesthesia / theatre response and neonatal support.
Haematemesis / melaena / haematochezia with shock or ongoing bleeding	Resuscitate, activate GI / surgical / endoscopy pathway, consider MHP, rapidly reverse anticoagulation and arrange urgent endoscopic / operative / transfer capability.
Critical-site bleeding: intracranial, airway / neck, retroperitoneal, pericardial or compartment-threatening	Immediate senior and specialty response; reversal and blood support as indicated; prioritize definitive control; avoid delay for nonessential investigations.
New fever, rigors, hypotension, dyspnoea, hypoxaemia, back / chest pain, dark urine, rash or angioedema during transfusion	Stop transfusion immediately; maintain IV with new saline tubing; ABCDE; verify identity; notify blood bank; treat anaphylaxis, sepsis, pulmonary oedema or shock without delay.

8. First 10 minutes: control, activate, resuscitate

1. Call for senior help and move to the resuscitation area. Use C-ABCDE and identify the likely bleeding source, time course, anticoagulants / antiplatelets, pregnancy status, known antibodies, sickle cell disease and transfusion preferences.
2. Apply immediate haemorrhage-control measures and mobilize definitive control. Do not delay theatre, interventional radiology, endoscopy, obstetric intervention or transfer for complete imaging or normalization of laboratory values.
3. Activate the MHP when major bleeding is present or strongly suspected. Give the blood bank two reliable identifiers where available, location, age / weight, clinical scenario, estimated urgency and special requirements.
4. Establish two short large-bore peripheral cannulas. Use IO access if rapid peripheral access fails; central access may follow but must not delay blood. Draw correctly labelled pre-transfusion samples before products when feasible without delaying life-saving transfusion.
5. Apply continuous monitoring, frequent blood pressure and temperature. Send FBC, group and screen / crossmatch, PT / INR, APTT, fibrinogen, blood gas, lactate, ionized calcium, electrolytes and condition-specific tests. Repeat at intervals based on bleeding rate.
6. Start warmed emergency blood when indicated. Use approved rapid delivery and warming equipment; assign one nurse to patient / unit checks and observations.
7. Give TXA promptly for eligible trauma or postpartum haemorrhage. Prepare calcium and reversal agents from the approved chart. Treat hypocalcaemia and severe hypothermia proactively.
8. Limit crystalloid. Use small, purpose-directed volumes only when blood is not yet available or for a specific indication. Avoid hydroxyethyl starch.
9. Reassess after every intervention: mental status, pulse, BP, skin perfusion, capillary refill, bleeding, ETCO₂ if ventilated, urine output, lactate trend, temperature, calcium and coagulation.
10. Communicate anticipated destination and transport needs early. In a small-island setting, activate regional referral and blood-product resupply before local inventory becomes critical.

9. Major haemorrhage activation, escalation and communication

Trigger domain	Examples supporting activation
Physiology	Persistent hypotension, shock index elevation, altered mental status, weak central pulse, rising lactate / base deficit, oliguria, peri-arrest state or repeated transient response.
Observed / estimated bleeding	Rapid external loss, ongoing gastrointestinal / obstetric / operative bleeding, large drain / suction volume, expanding internal collection or blood loss difficult to quantify but clinically significant.

Trigger domain	Examples supporting activation
Expected intervention	Immediate operation, endoscopy, embolization, massive obstetric response, transfer while bleeding, or anticipated need for multiple units before compatibility testing is complete.
Critical site / reduced reserve	Intracranial or airway bleeding, paediatric or pregnant patient, severe cardiopulmonary disease, profound baseline anaemia, anticoagulation, coagulopathy or rare antibodies.
Response failure	Failure to stabilize after initial blood, recurrent hypotension, escalating product requirement or inability to achieve source control locally.

ACTIVATION LANGUAGE: “Activate adult / paediatric / obstetric major haemorrhage for [patient identifiers], at [location], weight [if child], cause [if known], emergency blood required now / within ___ minutes, known antibodies or special requirements [state], destination [state].”

10. Haemorrhage control and source-specific action

Source	Immediate control and escalation
External / limb / junctional	Direct pressure, haemostatic dressing, wound packing where trained, tourniquet for uncontrolled life-threatening limb bleeding, splinting and immediate surgery / transfer.
Chest	Treat tension pneumothorax, apply chest drain / thoracostomy as indicated, recognize massive haemothorax and mobilize surgery; autotransfusion only under approved protocol.
Abdomen / pelvis / retroperitoneum	Pelvic binder for suspected unstable pelvic injury, urgent surgery / interventional radiology, minimal imaging in non-responders, and early transfer if definitive control unavailable.
Gastrointestinal	Airway protection when necessary, vasoactive / acid suppression therapy where indicated, urgent endoscopy and surgery / IR backup; use restrictive transfusion after bleeding is controlled, individualized to shock / cardiac ischaemia.
Obstetric	MOTIVE / local PPH bundle: uterine massage, uterotonics, TXA, IV access and warmed blood, genital-tract examination, retained-product management, balloon / surgery and early escalation.
Postoperative / vascular / gynaecological	Immediate responsible surgeon; reverse anticoagulation; return to theatre / endovascular control; avoid repeated transfusion without a source-control decision.
Airway / ENT / neck	Direct compression when safe, suction and early expert airway control, ENT / maxillofacial / vascular response; anticipate difficult airway and rapid deterioration.
Inherited bleeding disorder	Contact haemophilia / haematology service urgently; give the patient-specific factor or bypassing-agent plan when available; avoid intramuscular injections and unnecessary invasive procedures.

11. Damage-control resuscitation and physiological targets

- Use restrictive volume resuscitation until bleeding control in most active haemorrhage. Maintain sufficient central circulation and organ perfusion rather than normalizing blood pressure with crystalloid. Use a higher pressure target when traumatic brain injury, pregnancy, spinal cord injury or other organ-perfusion need predominates.
- Use warmed blood products rather than crystalloid for active major bleeding. A locally approved initial adult fixed ratio commonly uses approximately 1 unit plasma to 1 unit red cells, with early platelets; paediatric replacement is weight-based. Transition to targeted therapy promptly.
- Assess clinical response and serial trends, not one laboratory value. Haemoglobin may initially remain normal despite major blood loss.
- Use laboratory or viscoelastic results to guide plasma, platelets and fibrinogen once available. Avoid “chasing” mildly abnormal coagulation tests after bleeding has stopped.
- Prevent hypothermia: remove wet clothing, cover and actively warm, warm the room where feasible, and use approved blood / fluid warming. Aim for temperature at least 36°C where achievable.
- Monitor ionized calcium early and repeatedly during rapid transfusion; keep it in the normal range using the local calcium replacement chart. Correct severe acidosis by restoring perfusion and haemorrhage control rather than bicarbonate alone.

12. Sampling, patient identification and blood-bank communication

Step	Required standard
Identify	Use full name, date of birth and unique hospital number / emergency identifier. Apply a durable identity band before sampling or transfusion whenever possible. Never use bed / room number as identity.
Sample	Label at the bedside immediately after collection by the collector. Do not pre-label. Follow the blood bank’s independent second-sample / historical-group rule unless emergency release is authorized.
Request	State “major haemorrhage,” urgency, diagnosis, age / weight, pregnancy / childbearing potential, known antibodies, prior reactions, sickle cell disease, transplant / irradiation requirements and products already given.
Communicate	Use closed-loop read-back for identifiers, pack number, products, destination, delay, substitutions and deactivation. One named person should communicate with the laboratory.
Trace	Record unit / donation number, component, time issued, started and completed, staff checks, observations, reaction and final disposition. Return unused products within validated time / temperature limits.
Downtime	Use pre-agreed paper forms, emergency identifiers, runners, manual logs and blood-bank downtime issue / reconciliation process. Re-enter data after systems recover.

13. Emergency blood selection and transition

Situation	Operational approach
Immediate life threat before group known	Use emergency group O red cells according to blood-bank policy. Prioritize O RhD-negative / Kell-negative stock for children and patients with pregnancy potential where feasible; use O RhD-positive for other adults when appropriate to preserve scarce stock.
Plasma before group known	Use the locally approved universal / emergency plasma strategy, such as group AB or validated low-titre group A plasma, according to availability and patient group.
Group established	Change to ABO / RhD-compatible group-specific components as soon as the laboratory authorizes. Do not continue group O automatically when compatible stock is available.
Known antibodies / previous reaction	Call blood bank / haematology immediately. Life-saving incompatible emergency transfusion may still be necessary after senior risk-benefit decision; document advice and monitor closely.
Sickle cell disease	Avoid unnecessary transfusion; involve haematology early; provide appropriately matched HbS-negative red cells when feasible; consider delayed haemolytic reaction / hyperhaemolysis history.
Whole blood	Use low-titre group O whole blood only if licensed, stocked, governed and included in local adult / paediatric / obstetric policy. Do not improvise outside blood-bank control.
Transition / stock pressure	The blood bank may modify pack composition based on inventory, compatibility and regional supply. Clinical teams must receive and acknowledge substitutions and conserve scarce products.

14. Blood components, targets and targeted therapy

Component / parameter	Emergency use and practical target
Red cells	Restore oxygen-carrying capacity and perfusion. During active bleeding, transfuse from physiology and rate of loss rather than a single Hb. After control, reassess and use a restrictive strategy for most stable patients, individualized for ischaemia, chronic anaemia and symptoms.
Plasma	Use in the initial fixed-ratio MHP and for clinically important coagulation-factor deficiency with bleeding. Do not use merely for volume expansion or mild isolated INR elevation.
Platelets	Give early according to MHP and count / viscoelastic result. Common targets are $>50 \times 10^9/L$ during major bleeding and $>100 \times 10^9/L$ for traumatic brain injury or critical CNS / ocular bleeding, subject to specialist advice.
Fibrinogen	Replace early when low or rapidly falling. A common minimum target is $>1.5 \text{ g/L}$ in major bleeding; obstetric haemorrhage often requires a higher target around 2.0 g/L . Use cryoprecipitate or fibrinogen concentrate according to local policy.
PT / INR / APTT	Interpret with bleeding, anticoagulant exposure and fibrinogen. Aim to correct clinically important coagulopathy using targeted therapy; avoid plasma solely to normalize minor abnormalities.
Ionized calcium	Maintain in the normal range, commonly at least $1.0\text{--}1.1 \text{ mmol/L}$ during major transfusion. Use the approved calcium chloride / gluconate chart and account for route and concentration.
Temperature	Actively prevent and correct hypothermia; aim $\geq 36^\circ\text{C}$ when possible. Persistent temperature $<35^\circ\text{C}$ markedly worsens coagulopathy.
pH / lactate	Restore perfusion and control bleeding. Severe acidosis reduces coagulation and vasopressor effectiveness; follow serial lactate / base deficit and clinical response.
Viscoelastic testing	Use where trained and validated to identify fibrinogen deficit, delayed clot formation, platelet contribution and hyperfibrinolysis; it complements rather than replaces clinical judgement and conventional tests.

15. Tranexamic acid and other haemostatic medicines

Scenario	Action
Major trauma with active / suspected bleeding	Give IV TXA as soon as possible and within 3 hours of injury; do not give later than 3 hours unless specialist evidence of hyperfibrinolysis. Use the approved adult / paediatric dose chart.
Postpartum haemorrhage	Give TXA promptly as part of the obstetric haemorrhage bundle and within 3 hours of birth, alongside uterotonics and source control. Follow the obstetric protocol for repeat dosing.
Gastrointestinal bleeding	Do not use TXA routinely. Consider only for a specific specialist indication or approved local pathway.
Other surgical / medical bleeding	Use only when supported by the condition-specific protocol or specialist advice. Adjust for severe renal impairment and assess thrombotic / seizure risk where relevant.
Desmopressin / factor concentrates / bypassing agents	Use for a defined indication such as selected antiplatelet-associated critical bleeding, von Willebrand disease, haemophilia or uraemic platelet dysfunction, with haematology / specialist advice and local dosing guidance.
Recombinant factor VIIa	Not routine. Consider only as rescue in selected refractory bleeding after source control, warming, correction of calcium, fibrinogen, platelets and acidosis, and specialist consensus.

16. Calcium, temperature, acid-base and metabolic complications

Problem	Recognition and response
Hypocalcaemia	Prolonged QT, hypotension, poor contractility, arrhythmia, tetany or low ionized calcium. Check early and after major product increments; give calcium via the approved chart and recheck.
Hypothermia	Core temperature fall, cold products / environment, coagulopathy and arrhythmia. Warm patient, room, products and infusions; minimize exposure; use forced-air warming.

EMERGENCY DEPARTMENT CLINICAL PROTOCOL | MAJOR HAEMORRHAGE, BLOOD PRODUCTS, AND TRANSFUSION REACTIONS | DRAFT

Problem	Recognition and response
Hyperkalaemia	Risk with rapid / large-volume red-cell transfusion, older blood, renal failure and children. Monitor ECG and potassium; treat immediately if severe; discuss fresher / washed products only when indicated and feasible.
Citrate toxicity	Hypocalcaemia and hypomagnesaemia, especially with rapid plasma / platelet transfusion or liver failure. Monitor and replace according to results and clinical state.
Acidosis	Usually reflects shock and inadequate perfusion. Restore circulating volume with blood, control bleeding and ventilate appropriately. Bicarbonate is not a substitute for resuscitation.
Dilutional coagulopathy	Suspect with ongoing red-cell / crystalloid replacement, falling fibrinogen and platelets. Use balanced components and laboratory / viscoelastic guidance.
Air embolism / line complication	Stop infusion, clamp / secure line, left lateral positioning only if clinically appropriate, 100% oxygen and resuscitation; investigate equipment and report.

17. Anticoagulant and antiplatelet reversal

Agent / exposure	Life-threatening bleeding approach
Vitamin K antagonist	Stop drug; give four-factor PCC immediately plus IV vitamin K according to the approved INR / weight chart. Do not use plasma for reversal when PCC is available. Recheck INR and clinical haemostasis.
Dabigatran	Give idarucizumab when significant recent exposure and life-threatening / critical-site bleeding or urgent surgery are present. Check renal function and timing; consider specialist-guided dialysis when antidote unavailable or rebound occurs.
Apixaban / rivaroxaban / edoxaban	Establish drug, dose and last intake. Use the locally approved specific antidote where licensed and indicated, or four-factor PCC when appropriate. Obtain anti-Xa level if rapidly available but do not delay urgent reversal in a convincing life-threatening exposure.
Unfractionated heparin	Stop infusion; give protamine based on recent heparin dose / time using the local chart; avoid excessive protamine; repeat APTT / anti-Xa and reassess bleeding.
Low-molecular-weight heparin	Stop drug; protamine provides partial reversal and is time / dose dependent. Seek haematology advice for ongoing severe bleeding and renal impairment.
Thrombolytic / fibrinolytic therapy	Stop agent; urgent haematology / stroke / cardiology input; check fibrinogen and coagulation; replace fibrinogen and use antifibrinolytic therapy according to the approved critical-bleeding pathway.
Antiplatelet agents	Stop when appropriate. Platelet transfusion is not routine for all antiplatelet-associated bleeding; base use on bleeding site, drug, platelet function, surgery and specialist advice. Consider desmopressin only under an approved protocol.
Unknown agent	Search records, medicines, family / pharmacy information and pill containers; check renal / hepatic function and coagulation. Treat the bleeding and seek poison / haematology advice rather than delaying for perfect certainty.

REVERSAL SAFETY: The local reversal chart must specify product, indication, weight / dose bands, maximum dose, contraindications, repeat testing, thrombotic risk, pharmacy / blood-bank location and specialist contact. Do not copy doses from this framework without local validation.

18. Special populations and scenarios

Population / scenario	Additional safeguards
Paediatric major haemorrhage	Use weight-based activation packs and doses; early IO if access difficult; prevent hypothermia and hypocalcaemia; involve paediatrics / anaesthesia / surgery; avoid adult-volume assumptions.
Pregnancy / postpartum	Use obstetric MHP, left uterine displacement when indicated, early fibrinogen assessment, RhD / anti-D and fetomaternal-haemorrhage considerations, and simultaneous uterine / surgical control.
Traumatic brain injury	Avoid hypotension and hypoxaemia; use less restrictive pressure targets when cerebral perfusion is threatened; aim for higher platelet count and correct anticoagulation promptly.
Older / cardiac / renal patient	Balance active bleeding against TACO risk after stabilization; avoid unnecessary crystalloid, use slower non-emergency transfusion and reassess after each unit when no longer bleeding.
Liver disease	Do not infer bleeding risk from INR alone. Use clinical bleeding, fibrinogen, platelets and viscoelastic testing; avoid indiscriminate plasma; involve hepatology / haematology.
Sickle cell / multiple antibodies	Early blood-bank and haematology involvement; retrieve antibody history; use phenotype / genotype-matched HbS-negative red cells where feasible; watch for delayed haemolysis / hyperhaemolysis.
Refusal of blood	Assess capacity and valid advance decision; clarify acceptable components, fractions, cell salvage and medicines; use blood-conservation strategies; involve senior, legal / ethics and specialist teams without delaying acceptable life-saving care.
Limited blood inventory / island transfer	Prioritize source control, activate regional blood supply and receiving centre early, conserve O-negative stock, document substitutions and plan transport of patient and products under validated conditions.

19. Deactivation, transition and product reconciliation

1. The clinical lead must explicitly deactivate or step down the MHP when bleeding is controlled, physiology is stabilizing and anticipated product need has reduced. Silence or transfer is not deactivation.
2. Notify the transfusion laboratory immediately, state products still required and whether crossmatched / special units should remain reserved.
3. Return unopened components promptly in validated transport conditions. Never place products in an unmonitored domestic refrigerator or leave them at bedside “just in case.”

4. Reconcile every issued unit as transfused, returned, transferred, wasted, quarantined for reaction or unaccounted. Escalate discrepancies immediately.
5. Continue targeted correction, warming and surveillance for rebleeding, hypocalcaemia, hyperkalaemia, TACO, thrombosis and organ injury after the fixed-ratio phase ends.
6. Complete a structured clinical and blood-bank handover and arrange post-event review for high product use, delay, near miss, wastage, incompatible emergency transfusion or adverse reaction.

20. Safe administration of blood components

Stage	Required action
Before collection	Confirm prescription, indication, consent / emergency basis, patient identity, component, special requirements, venous access, baseline observations, TACO risk and reaction readiness.
Collection / transport	Use authorized staff and validated box; collect only when ready to transfuse; verify patient and product details; avoid uncontrolled delays outside approved storage.
Bedside check	Two trained staff or validated electronic process verify patient identity band, prescription, component, ABO / RhD compatibility, donation number, expiry, special requirements and integrity at the bedside.
Start	Record baseline temperature, pulse, BP, respiratory rate and SpO ₂ ; begin at a controlled rate when non-emergent and observe closely for the first 15 minutes. In major haemorrhage, use continuous bedside observation and rapid monitoring.
During	Use an approved blood administration set; do not add medicines to the blood line. 0.9% sodium chloride is the standard compatible crystalloid unless the blood service approves another solution. Use a validated warmer / rapid infuser.
Complete	Record completion time and observations, response, unit traceability and disposition. Reassess the need for further units when bleeding is controlled.
High TACO risk	Confirm indication and dose; consider single-unit strategy, slower rate, split unit and diuretic only when appropriate; monitor fluid balance and respiratory status closely.

21. Recognizing an acute transfusion reaction

- Assume a transfusion reaction when a new symptom or deterioration begins during transfusion or soon afterward, even if the patient is already critically ill.
- Danger signs include fever or rigors, hypotension, hypertension with dyspnoea, chest / back / loin pain, anxiety, flushing, urticaria, wheeze, stridor, angioedema, hypoxaemia, pulmonary oedema, haemoglobinuria, oliguria, bleeding / DIC, nausea or collapse.
- Mild isolated urticaria can progress. Fever can represent haemolysis or bacterial contamination, not merely a febrile non-haemolytic reaction. Pulmonary oedema may be TACO, TRALI or the underlying disease.
- Any identity discrepancy, damaged / abnormal unit, wrong component, unexpected blood-bank alert or equipment concern is a transfusion emergency even before symptoms develop.

22. Immediate management of a suspected reaction

1. STOP the transfusion immediately. Clamp the blood line. Do not restart until the reaction has been assessed and the transfusion laboratory / senior clinician authorizes it.
2. Call for help and assess ABCDE. Give oxygen, airway support, adrenaline for anaphylaxis, sepsis treatment, diuresis / ventilatory support for likely TACO, and full resuscitation as clinically indicated.
3. Maintain IV access with a new administration set and 0.9% sodium chloride. Do not flush the implicated blood through the line.
4. Recheck patient identity, prescription, compatibility label, donation number, blood group and unit integrity at the bedside. Notify the transfusion laboratory immediately and state severity and symptoms.
5. Retain and return the blood bag and giving set according to laboratory instructions. Quarantine linked units if advised. Do not discard them.
6. Record observations and fluid balance frequently. Send the required post-reaction blood / urine samples; obtain blood cultures from patient and component when bacterial contamination is suspected.
7. Document the reaction, treatment and outcome; inform the patient / family when appropriate; submit haemovigilance, regulatory and incident reports; flag future transfusion requirements.

NEVER ASSUME "JUST A FEVER." Fever, rigors or shock during transfusion can represent acute haemolysis or bacterial contamination. Stop the transfusion and investigate before considering any restart.

23. Reaction-specific emergency management

Likely reaction	Clues and immediate treatment
Acute haemolytic transfusion reaction	Fever, rigors, pain, hypotension, haemoglobinuria, DIC or renal injury; often identity / compatibility error. Stop transfusion, resuscitate, notify blood bank urgently, send haemolysis / compatibility samples, maintain renal perfusion and treat DIC / shock.
Bacterial contamination / transfusion-transmitted sepsis	High fever, rigors, profound hypotension, vomiting or collapse. Stop, obtain patient and component cultures, start broad-spectrum IV antibiotics and sepsis resuscitation immediately; alert blood service to linked components.
Anaphylaxis / severe allergy	Airway swelling, wheeze, stridor, hypoxaemia or hypotension, often without fever. Give IM adrenaline promptly, airway / oxygen / fluids and repeated treatment per anaphylaxis protocol; do not restart.

EMERGENCY DEPARTMENT CLINICAL PROTOCOL | MAJOR HAEMORRHAGE, BLOOD PRODUCTS, AND TRANSFUSION REACTIONS | DRAFT

Likely reaction	Clues and immediate treatment
Mild allergic reaction	Isolated pruritus / urticaria without airway, respiratory, cardiovascular or fever features. Stop and assess; give antihistamine if appropriate. Restart only after complete resolution and explicit senior / transfusion-lab approval.
Febrile non-haemolytic reaction	Fever / chills without haemolysis or sepsis after dangerous causes excluded. Stop and assess; antipyretic / symptomatic treatment. Restart only if mild, symptoms resolve and laboratory / senior advice permits.
TACO	Dyspnoea, hypoxaemia, pulmonary oedema, hypertension, raised JVP, positive fluid balance, cardiac / renal risk, often within 12 hours. Sit upright, oxygen / NIV, diuretic if appropriate, stop transfusion, manage heart failure and report.
TRALI	Acute hypoxaemia and bilateral pulmonary oedema during or within about 6 hours, often with hypotension / fever and no evidence that circulatory overload is primary. Stop transfusion, oxygen / lung-protective ventilation, critical-care support; avoid routine diuresis if not overloaded; notify blood bank.
Hypotensive reaction	Abrupt isolated hypotension temporally related to transfusion after excluding haemorrhage, haemolysis, sepsis and anaphylaxis. Stop, support circulation and investigate; review ACE-inhibitor exposure and future strategy.
Massive-transfusion complication	Hypocalcaemia, hyperkalaemia, hypothermia, acidosis, dilutional coagulopathy, air / line event. Continue life-saving resuscitation while correcting the specific abnormality and checking equipment / product pathway.

24. Pulmonary reaction differentiation: TACO versus TRALI

Feature	TACO more likely	TRALI more likely
Timing	During or up to 12 hours after transfusion	During or within about 6 hours after transfusion
Blood pressure / volume	Hypertension, raised JVP, positive balance, oedema, cardiac / renal disease	Often normal or low BP; no primary evidence of overload
Investigations	Cardiogenic pulmonary oedema, elevated natriuretic peptide may support, response to diuresis	Bilateral non-cardiogenic oedema; natriuretic markers not diagnostic; alternative ARDS risks assessed
Treatment	Stop transfusion; upright; oxygen / NIV; diuretic and heart-failure treatment when appropriate	Stop transfusion; oxygen / ventilation; critical care; conservative fluids; no routine diuretic unless overload coexists
Prevention	Confirm indication / volume, single-unit reassessment, slower rate, split unit and selective diuretic	Blood-service donor / product mitigation; identify and report case; future transfusion planning with transfusion medicine

25. Delayed reactions and follow-up

Reaction / issue	When to suspect and action
Delayed haemolytic reaction / hyperhaemolysis	Falling Hb, jaundice, dark urine, pain or reticulocyte change days to weeks later, especially with sickle cell disease or antibodies. Urgent FBC, haemolysis screen, DAT / antibody testing and haematology / blood-bank review; avoid further transfusion unless essential and specialist-guided.
Post-transfusion purpura	Severe thrombocytopenia and bleeding typically 5-12 days after transfusion. Urgent haematology and transfusion-medicine management.
Transfusion-associated graft-versus-host disease	Fever, rash, diarrhoea, hepatitis and pancytopenia 2-42 days after cellular transfusion. Medical emergency; urgent haematology / infectious-disease assessment and blood-bank notification.
Transfusion-transmitted infection	Unexplained fever, hepatitis, rash or infection after transfusion. Test and report through blood bank / public health; trace linked products and recipients as directed.
Patient information	Provide the component record and reaction advice required locally. Tell patients to seek urgent care for fever, dyspnoea, dark urine, jaundice, rash or unexpected bleeding after discharge.

26. Consent, capacity and refusal

- Explain indication, expected benefit, important risks, alternatives and likelihood of further transfusion when circumstances permit. Record valid consent or the reason prior discussion was impossible.
- In an immediate life-threatening emergency without capacity or an available valid refusal, act in the patient's best interests under local law and document the emergency basis.
- Respect a capacitous refusal and valid advance decision. Clarify precisely which components, fractions, cell salvage, factor concentrates and procedures are acceptable; do not assume all patients with the same faith make the same choices.
- Use haemorrhage prevention, early source control, TXA where indicated, meticulous surgical technique, cell salvage if acceptable / available, iron / erythropoietin planning outside the immediate emergency, and minimize phlebotomy.
- In children, pregnancy or disagreement, involve senior clinical, legal / ethics, safeguarding and specialist teams urgently according to local law, while providing immediately necessary acceptable care.

27. Transfer, admission and handover

Requirement	Standard
Before transfer	Control external bleeding; stabilize airway / breathing; establish access; continue warming; correct immediately dangerous calcium / potassium; ensure products and reversal therapy can continue; obtain receiving-centre acceptance.
Blood products in transit	Use products only under blood-bank authorization, validated transport container, documented chain of custody, traceability and trained escort. Confirm whether receiving facility can accept / store unused units.
Monitoring	Continuous ECG and SpO2; frequent or invasive BP; temperature; ETCO2 if ventilated; product and infusion checks; readiness for recurrent bleeding or transfusion reaction.

Requirement	Standard
Escort / equipment	Clinician and nurse / paramedic competent in haemorrhage, airway, rapid transfusion and reaction treatment; oxygen, suction, warming, emergency medicines, calcium, reversal agents and backup access.
Handover	Mechanism / source, control achieved / pending, MHP activation time, products and pack numbers, TXA / calcium / reversal, laboratory trends, antibodies / special requirements, reactions, inventory constraints and next action / destination.
Admission	Patients with major haemorrhage, critical-site bleeding, ongoing transfusion / reversal, reaction requiring treatment, significant coagulopathy or uncertain source require admission or specialist transfer; discharge only after a separate condition-specific pathway is satisfied.

28. Documentation and handover record

Field	Required detail
Activation	Time, trigger, caller, MHP type, blood-bank contact, patient identifiers and first-product request / arrival.
Bleeding and control	Source, estimated / measured loss, control measures, procedures, consultants, transfer decision and time to definitive control.
Physiology	Serial BP / pulse / shock index, mental status, SpO2, temperature, urine output, lactate / base deficit and response.
Blood and medicines	Each component / unit, start / completion, TXA, calcium, reversal agent, fluids, vasopressors and adverse events.
Laboratory	Hb, platelets, PT / INR, APTT, fibrinogen, ionized calcium, potassium, blood gas and viscoelastic results with treatment response.
Reaction	Symptoms, time, unit, stop time, identity check, blood-bank notification, samples, treatment, outcome and reporting.
Deactivation / reconciliation	Time and decision maker, remaining need, units transfused / returned / wasted / quarantined, laboratory acknowledgement and handover destination.

29. Quality indicators and audit

Indicator	Suggested measure
Recognition / activation	Time from qualifying physiology / clinician recognition to MHP activation; activations delayed while awaiting laboratory values.
Product delivery	Time from activation to first red cells and first haemostatic pack; time to group-specific product; stock-out / substitution events.
Source control	Time to theatre, endoscopy, embolization, obstetric control or transfer; proportion with repeated transfusion before a documented control plan.
Balanced resuscitation	Ratio and timing of RBC / plasma / platelets during uncontrolled bleeding; time to fibrinogen result / replacement; crystalloid volume.
Physiological protection	Proportion with temperature and ionized calcium measured; hypothermia <35°C, severe hypocalcaemia, hyperkalaemia and peri-transfusion arrest.
Safety / identification	Wrong blood in tube, incorrect blood component transfused, near miss, missing traceability, emergency release and incompatible transfusion events.
Reactions	TACO, TRALI, haemolysis, bacterial contamination, anaphylaxis, delayed haemolysis and completion of reaction investigation / haemovigilance reports.
Stewardship	Units wasted, O-negative utilization by recipient group, avoidable transfusion, single-unit reassessment after bleeding control and product expiry.
Debrief / learning	Percentage of high-volume events or serious incidents receiving multidisciplinary debrief, blood-bank review and action-plan closure.

30. Training and implementation

- Annual multidisciplinary simulation for adult, paediatric and obstetric major haemorrhage, including MHP call, blood-bank communication, emergency release, rapid infuser, calcium, source control, transfer and deactivation.
- At least six-monthly low-frequency high-risk drills for wrong-patient / wrong-unit interception, anaphylaxis, bacterial contamination, TACO / TRALI and blood-bank / IT downtime.
- Competency assessment for bedside identity checks, product collection, blood warmer / infuser, reaction sampling, traceability and return of unused products.
- Joint ED-blood bank review of every serious reaction, incompatible emergency transfusion, product delay, stock-out, major wastage or activation failure.
- Visible one-page algorithms in resuscitation, obstetric, theatre, blood-bank and ambulance interfaces; standardized packs, labels, forms and contact numbers.

31. Local configuration before approval

- ☐ Adult, paediatric and obstetric MHP activation and deactivation criteria, pack contents, pack numbering and delivery times approved.
- ☐ 24/7 contacts for blood bank, haematology / transfusion medicine, surgery, obstetrics, anaesthesia, critical care, endoscopy, interventional radiology and regional transfer displayed.
- ☐ Emergency group O red-cell and plasma allocation policy, including O-negative conservation and childbearing-potential definition, approved.

EMERGENCY DEPARTMENT CLINICAL PROTOCOL | MAJOR HAEMORRHAGE, BLOOD PRODUCTS, AND TRANSFUSION REACTIONS | DRAFT

- ☐ Product inventory, regional resupply, transport container, emergency courier / marine / air pathway and downtime process validated.
- ☐ TXA, calcium and anticoagulant-reversal charts with adult / paediatric / obstetric dosing, stock location and repeat testing approved.
- ☐ Laboratory / viscoelastic test frequency and treatment thresholds, including fibrinogen and platelet targets, approved.
- ☐ Blood warmer, rapid infuser, pressure devices and point-of-care equipment standardized, maintained and included in competency training.
- ☐ Blood administration, consent, TACO risk assessment, reaction management, sample set and haemovigilance forms embedded in the record.
- ☐ Sick cell / complex-antibody, irradiated / CMV-safe and neonatal / paediatric special-component requirements accessible 24/7.
- ☐ MHP and reaction audit dashboard, case-review trigger and serious-incident reporting process assigned to the transfusion committee.

32. Source guidance for local adaptation

Source	Key use in this protocol
British Society for Haematology. Haematological Management of Major Haemorrhage. 2022; reviewed and addendum updated 2025.	Multidisciplinary MHP design, empiric and targeted component support, fibrinogen / platelet management, laboratory interface and audit.
British Society for Haematology. Investigation and Management of Acute Transfusion Reactions. 2023.	Immediate stop / assess / notify pathway, reaction investigations, subsequent transfusion and haemovigilance.
NICE. Major Trauma: Assessment and Initial Management (NG39).	Early TXA within 3 hours, rapid anticoagulant reversal, physiological MHP activation, restrictive volume resuscitation, fixed-ratio blood and early transition to laboratory guidance.
NICE. Blood Transfusion (NG24), reviewed February 2026.	General component indications, patient safety, consent, restrictive red-cell practice after stabilization and use of plasma / platelets / cryoprecipitate / PCC.
Serious Hazards of Transfusion (SHOT). 2024 Annual Report and TACO Pre-transfusion Risk Assessment.	TACO prevention, minimal effective transfusion, reaction surveillance, human factors and learning from incidents.
AABB. Red Blood Cell Transfusion: 2023 International Guidelines and Circular of Information.	Restrictive transfusion strategy for stable patients, individualized clinical decision-making and component risks.
WHO. Consolidated Guidelines for Prevention, Diagnosis and Treatment of Postpartum Haemorrhage. 2025.	Early recognition and bundled obstetric response including massage, uterotonics, TXA, IV fluids, examination and escalation.
Local blood service / national regulator / pharmacy formulary.	Product specifications, compatibility, emergency release, transport, traceability, reversal agents, reporting and legal requirements.

Annex A. One-page major-haemorrhage workflow

Stage	Action
1. Recognize	Active / suspected bleeding + shock, critical site, rapid loss, anticoagulant exposure, or need for urgent control. Do not wait for Hb.
2. Control	Direct pressure / tourniquet / binder / uterine measures; activate surgery / obstetrics / endoscopy / IR / transfer.
3. Activate	Call adult / paediatric / obstetric MHP; give identifiers, location, weight, cause, urgency, antibodies and destination.
4. Access / sample	Two large-bore IVs or IO; bedside-labelled group / screen, FBC, coagulation, fibrinogen, gas, lactate, ionized calcium.
5. Resuscitate	Warmed emergency blood; fixed ratio initially; TXA when indicated; calcium; anticoagulant reversal; limit crystalloid.
6. Reassess	Bleeding, perfusion, temperature, calcium, potassium, Hb, platelets, INR / APTT, fibrinogen, VET and product need.
7. Target	Switch to group-specific / compatible and laboratory-guided products; definitive source control.
8. Deactivate	Explicit call to blood bank; return and reconcile products; continue surveillance and structured handover / review.

Annex B. Major-haemorrhage activation checklist

- ☐ Patient name / emergency ID _____ DOB _____ hospital number _____ weight _____ kg.
- ☐ Location _____ clinical lead _____ laboratory communicator _____.
- ☐ Cause / source _____ active bleeding YES / NO critical site _____.
- ☐ Known anticoagulant / antiplatelet _____ last dose / time _____.
- ☐ Pregnancy / postpartum / childbearing potential _____ sickle cell / antibodies / prior reaction _____.
- ☐ MHP activated at _____ blood bank called at _____ first product requested _____ arrived _____.
- ☐ Haemorrhage control plan: pressure / tourniquet / binder / theatre / endoscopy / IR / obstetrics / transfer.
- ☐ TXA indication / time _____ calcium plan _____ reversal agent / time _____.
- ☐ Baseline: BP _____ pulse _____ SpO2 _____ temp _____ lactate _____ iCa _____ fibrinogen _____.
- ☐ Destination / receiving clinician _____ transport plan _____.

Annex C. Major-haemorrhage running record

Time	BP / HR / temp	Bleeding / intervention	RBC	Plasma	Platelets / fibrinogen	TXA / calcium / reversal	Key labs

Annex D. Suspected transfusion-reaction checklist

- ☐ STOP transfusion; clamp line; note time _____ and unit number _____.
- ☐ Call senior help; ABCDE; oxygen / adrenaline / sepsis / pulmonary-oedema treatment as indicated.
- ☐ Keep IV access with NEW tubing and 0.9% sodium chloride; do not flush implicated blood.
- ☐ Recheck patient identity, prescription, compatibility label, donation number and unit integrity.
- ☐ Notify blood bank at _____; person contacted _____; do not discard bag / giving set.
- ☐ Observations: T _____ HR _____ BP _____ RR _____ SpO2 _____ urine / haemoglobinuria _____.
- ☐ Symptoms: fever / rigors / pain / rash / wheeze / angioedema / dyspnoea / pulmonary oedema / hypotension / dark urine.
- ☐ Samples sent: post-reaction blood / DAT / haemolysis / coagulation / cultures / urine / BNP / other _____.
- ☐ Treatment and response _____.
- ☐ Reaction report / haemovigilance / patient alert completed by _____ at _____.

Annex E. Emergency product and reversal quick-reference — complete locally

Item	Local standard / location
Adult MHP Pack 1 / Pack 2 contents	_____
Paediatric / obstetric pack contents	_____
Emergency O red-cell selection	_____
Emergency plasma / whole blood policy	_____
TXA adult / child / obstetric dosing	_____
Calcium chloride / gluconate dosing and monitoring	_____
Warfarin reversal: PCC + vitamin K	_____
Dabigatran / factor Xa inhibitor reversal	_____
Heparin / LMWH reversal	_____
Reaction sample pack / blood-bank number	_____
Regional blood supply / transfer contact	_____