

[HOSPITAL / HEALTH AUTHORITY NAME]

MAJOR TRAUMA AND MULTIPLE INJURY PATHWAY**Protocol 31: Trauma-Team Activation, <C>ABCDE Resuscitation, Haemorrhage Control, Damage-Control Care, Imaging, Transfer, and Safe Disposition**

DRAFT FOR EMERGENCY MEDICINE, SURGERY, ANAESTHESIA, CRITICAL CARE, ORTHOPAEDICS, NEUROSURGERY, RADIOLOGY, TRANSFUSION MEDICINE, PAEDIATRICS, OBSTETRICS, NURSING, EMS, LABORATORY, PHARMACY, TRANSFER, REHABILITATION, AND CLINICAL-GOVERNANCE REVIEW

STATUS: This is a draft clinical-governance document. Trauma activation criteria, team composition, airway and chest procedures, major-haemorrhage packs, transfusion ratios, tranexamic-acid dosing, anticoagulant reversal, calcium replacement, paediatric dosing, imaging access, operating-theatre and interventional-radiology capability, specialist availability, and inter-island or overseas transfer arrangements must be reconciled with current national guidance, local formulary, blood-bank capacity, and approved linked protocols before implementation.

IMMEDIATE SAFETY RULE: In major trauma, treat catastrophic external bleeding and immediately reversible airway or breathing threats before completing diagnosis. Do not delay haemorrhage control, chest decompression, blood-product resuscitation, or transfer for non-essential tests.

Document control	Details
Document owner	Emergency Department / Medical Services Directorate / Nursing Services / Clinical Governance
Clinical leads	Emergency Medicine; General Surgery; Anaesthesia / Critical Care; Orthopaedics; Radiology; Transfusion Medicine
Applies to	Adults, children, pregnant patients, older adults, and other patients with actual or suspected major trauma or multiple injury
Linked protocols	Airway and ventilatory support; major haemorrhage; head and spinal injury; thoracic / abdominal / pelvic trauma; limb injury; burns; analgesia / sedation; transfer; safeguarding; death in the ED
Version	Draft 1.0
Approval status	For local multidisciplinary validation
Review cycle	At least every 2 years, and after major guideline, service, formulary, blood-bank, or transfer-system change
Minimum audit domains	Activation, time to senior review, TXA, blood products, temperature, CT / source control, transfer, documentation, mortality review
High-risk exclusions	This protocol does not replace specialist operative, neurosurgical, paediatric, obstetric, or critical-care judgment
Implementation requirement	Simulation, equipment checks, blood-bank drills, transfer exercises, and signed local medication / procedure appendices

1. Purpose

To provide a standardized emergency-department pathway for rapid recognition, coordinated resuscitation, diagnosis, haemorrhage control, definitive-care activation, transfer, and disposition of patients with major trauma or multiple injury. The protocol prioritizes prevention of avoidable death and disability through immediate treatment of time-critical threats, repeated reassessment, explicit team leadership, and early movement to the location capable of definitive care.

2. Scope

This protocol applies from pre-alert or first contact until operative intervention, interventional radiology, critical-care admission, ward admission, transfer, discharge, or death. It includes blunt, penetrating, crush, blast, and mixed-mechanism trauma. Detailed management of individual injuries is addressed in linked protocols; this document governs the initial integrated response when more than one body system may be injured or when a single injury threatens life or long-term function.

3. Core policy statements

- Major trauma is a time-dependent systems emergency. Activate the trauma team from physiology, anatomy, mechanism, clinical concern, or deterioration; do not wait for complete diagnosis.
- Use a structured <C>ABCDE approach: catastrophic haemorrhage, Airway with spinal protection, Breathing, Circulation with haemorrhage control, Disability, and Exposure / environment. Treat threats as they are found and repeat the survey after every major intervention or deterioration.
- One clearly identifiable trauma team leader directs priorities, allocates roles, receives handover, summarizes findings aloud, and confirms the destination and next decision point. One designated scribe records events contemporaneously.
- Airway intervention must not distract from haemorrhage control. Anticipate difficult airway, cervical injury, facial trauma, contamination, aspiration, and physiological collapse after induction.
- Clinical tension pneumothorax with haemodynamic instability or severe respiratory compromise is treated before imaging by a trained clinician using the locally approved decompression technique followed by definitive pleural drainage.
- Control external bleeding with direct pressure, wound packing and approved haemostatic dressing, and a tourniquet for life-threatening limb bleeding not controlled promptly. Record tourniquet time and do not intermittently release it in the ED.
- Apply a purpose-made pelvic binder at the level of the greater trochanters when pelvic haemorrhage is suspected after blunt high-energy trauma. Do not repeatedly compress or "spring" the pelvis.
- Activate the major-haemorrhage protocol using physiology, bleeding pattern, response to resuscitation, and clinical judgment. Do not rely on a single score or initial haemoglobin.
- Use damage-control resuscitation for active major bleeding: early blood components, minimal crystalloid, rapid haemorrhage control, tranexamic acid within 3 hours when indicated, temperature preservation, calcium monitoring and correction, and goal-directed haemostatic therapy.
- Permissive hypotension may be used before bleeding control in selected adults without brain or spinal cord injury. Avoid hypotension and hypoxaemia in traumatic brain injury, pregnancy, children, and other patients requiring organ perfusion.
- Unstable non-responders require the minimum imaging needed to direct immediate source control. Stable or responding adults with blunt suspected multiple injury generally require urgent trauma CT according to local capability; a negative FAST does not exclude serious haemorrhage.
- Analgesia is essential and should be titrated without delaying resuscitation. Sedation and paralysis require an airway, ventilation, haemodynamic, and failed-airway plan.
- Prevent secondary injury: avoid hypoxia, hypotension, hypothermia, hypocalcaemia, severe acidosis, hyperglycaemia or hypoglycaemia, excessive ventilation, pressure injury, and unnecessary movement.
- If definitive trauma, surgical, neurosurgical, interventional-radiology, paediatric, or obstetric capability is unavailable, activate transfer early while continuing stabilization. Do not delay transfer for tests that will not change immediate management.
- Every unexpected death, delayed activation, delayed source control, unplanned deterioration, massive-transfusion event, transfer failure, or major deviation from pathway requires structured multidisciplinary review.

4. Definitions and activation framework

Term	Operational definition
Major trauma	An injury or combination of injuries that is life-threatening, limb-threatening, organ-threatening, or likely to cause substantial long-term disability.
Multiple injury	Suspected or confirmed injury involving more than one body region or system, including occult injury after high-energy mechanism.
Haemorrhagic shock	Inadequate tissue perfusion caused by blood loss; tachycardia and hypotension may be absent early, especially in children, older adults, athletes, pregnancy, and patients taking rate-limiting medicines.
Transient responder	Initial improvement with resuscitation followed by recurrent shock, suggesting ongoing bleeding and need for urgent definitive control.
Non-responder	Persistent critical physiology despite immediate resuscitation, requiring rapid exclusion of reversible thoracic causes and immediate haemorrhage-control strategy.
Damage-control resuscitation	A coordinated strategy of rapid bleeding control, restricted crystalloid, balanced haemostatic resuscitation, TXA when indicated, temperature and calcium management, and correction of coagulopathy.

Term	Operational definition
Definitive care	The intervention and location capable of controlling the principal injury: operating theatre, interventional radiology, neurosurgery, specialist centre, critical care, or combined pathway.
Activation level	Examples; local criteria must be approved
FULL / RED trauma response	Airway compromise; GCS ≤ 8 or falling; SBP < 90 mmHg or age-adjusted shock; active major bleeding; penetrating neck / chest / abdomen / pelvis; unstable chest injury; suspected pelvic haemorrhage; amputation; multiple proximal long-bone fractures; major crush; severe burns with trauma; clinical concern for immediate death.
LIMITED / ORANGE trauma response	Stable but high-risk mechanism; anticoagulated head injury; focal neurological deficit; significant chest, abdominal, pelvic, or spinal pain; two or more injured regions; older or pregnant patient with concerning mechanism; child with significant mechanism or abnormal physiology.
UPGRADE criteria	Any deterioration, new oxygen requirement, rising shock index, falling GCS, recurrent hypotension, positive or concerning imaging, increasing abdominal distension, uncontrolled pain, new neurovascular deficit, or senior clinical concern.

5. Roles and accountability

Role	Minimum responsibility
Trauma team leader	Receive pre-alert and handover; lead <C>ABCDE; state priorities; assign procedures; authorize imaging / source control / transfer; ensure reassessment and documentation.
Airway clinician	Assess airway and cervical risk; prepare oxygenation, RSI, difficult-airway and failed-airway plans; secure and confirm airway; oversee ventilation and sedation.
Procedure / circulation clinician	Control bleeding; obtain access; perform thoracic procedures where credentialed; support ultrasound; coordinate blood sampling and haemorrhage-control procedures.
Primary nurse	Monitoring, IV / IO access, medicines, blood-product checks, warming, specimen handling, urine output, and time-critical prompts.
Scribe / timekeeper	Record findings, vital trends, procedures, medication and blood times, communications, imaging, decisions, and disposition; announce elapsed time and scheduled reassessments.
Surgery / orthopaedics / anaesthesia / critical care	Attend according to activation criteria; define operative or critical-care plan; participate in transfer when capability is unavailable.
Radiology / radiographer	Prioritize trauma imaging, communicate immediately actionable findings, and support direct movement to interventional or operative care.
Blood bank / laboratory	Activate adult or paediatric major-haemorrhage pathway; issue emergency blood; track component use; expedite blood gas, haemoglobin, coagulation, fibrinogen, chemistry, and group / screen.
Transfer coordinator / EMS	Identify receiving service and transport platform early; match escort, equipment, blood, oxygen, and monitoring to patient risk.
Security / support staff	Control access, preserve evidence when relevant, assist family flow, maintain privacy, and support staff safety.

6. Pre-alert, preparation, and triage

- Use an ATMIST or MIST pre-alert: Age, Time, Mechanism, Injuries suspected, Signs / vital trends / GCS, and Treatment given, plus ETA, contamination, pregnancy, anticoagulants, entrapment, safeguarding concerns, and special equipment needs.
- The senior nurse or trauma team leader determines response level and pre-notifies surgery, anaesthesia, radiology, blood bank, operating theatre, paediatrics, obstetrics, and transfer services as indicated.
- Prepare the resuscitation bay before arrival: warming, suction, difficult-airway equipment, ventilator, thoracostomy and chest-drain equipment, pelvic binder, haemorrhage-control supplies, ultrasound, rapid infuser, blood warmer, paediatric cart, transfer pack, and PPE.
- For chemical, biological, radiological, or hazardous-material exposure, protect staff and perform decontamination before entry to the main ED where clinically possible; life-saving interventions continue with appropriate PPE.

7. First 10 minutes: parallel action

1. Receive a silent, structured handover while the team maintains manual haemorrhage control, airway support, and spinal alignment. Transfer the patient once, with coordinated movement and immediate reassessment.
2. Identify catastrophic external haemorrhage and control it immediately with pressure, packing, haemostatic dressing, tourniquet, or pelvic binder as appropriate.
3. Assess airway patency, breathing, circulation, GCS, pupils, and major exposure. Treat airway obstruction, tension pneumothorax, massive external bleeding, and peri-arrest physiology before imaging.
4. Attach ECG, pulse oximetry, non-invasive BP cycling, temperature, and capnography when ventilated or deeply sedated. Record a complete baseline set and trend continuously.
5. Obtain two large-bore peripheral IVs; use IO if access is delayed. Draw group and screen / crossmatch, blood gas with lactate and ionized calcium, FBC, PT/INR, APTT, fibrinogen, electrolytes, renal function, glucose, and pregnancy test when relevant.
6. Activate the major-haemorrhage protocol early when active bleeding or shock is suspected. Start emergency blood products rather than repeated crystalloid in major bleeding.
7. Give TXA as soon as possible and within 3 hours of injury for active or suspected significant bleeding according to the approved adult or paediatric monograph. Do not wait for coagulation or viscoelastic results.
8. Prevent heat loss: remove wet clothing, warm the room, use forced-air warming, warm fluids and blood, cover the head and exposed areas, and minimize unnecessary exposure.
9. Decide the immediate destination: resuscitation bay, CT, operating theatre, interventional radiology, critical care, or transfer. The unstable non-responder should not remain in the ED for prolonged diagnostics.
10. Re-run <C>ABCDE after each intervention, on return from imaging, during transfer of care, and whenever physiology changes.

8. Primary survey: <C>ABCDE

8.1 Catastrophic haemorrhage

- Expose enough to find external bleeding while maintaining temperature and dignity. Inspect scalp, axillae, groins, perineum, back, and under the patient during controlled movement.
- Use firm direct pressure first. Pack deep junctional wounds with gauze or approved haemostatic dressing and maintain continuous pressure for the product-specified interval.
- Apply a commercial tourniquet proximal to life-threatening extremity bleeding that is not controlled promptly. Tighten until bleeding stops and the distal pulse is absent; record exact time and leave visible.
- Stabilize impaled objects in place. Do not remove them in the ED unless they obstruct essential resuscitation and removal is authorized by the senior procedural or surgical clinician.
- Apply a pelvic binder over the greater trochanters for suspected unstable pelvic injury with bleeding risk. Check skin, genital, and limb perfusion; binder removal or repositioning is a senior decision in a controlled setting.

8.2 Airway with cervical-spine protection

- Look for obstruction, blood, vomit, teeth, facial instability, expanding neck haematoma, hoarseness, stridor, burns, subcutaneous emphysema, or reduced airway reflexes. Suction early and repeatedly.
- Use jaw thrust, airway adjuncts, two-person bag-mask ventilation, and manual in-line stabilization while preparing definitive airway management. Avoid prolonged attempts that delay oxygenation.
- Use drug-assisted RSI when the patient cannot maintain airway or ventilation, has severe traumatic brain injury requiring protection, or is expected to deteriorate. Prepare pre-oxygenation, haemodynamic support, backup supraglottic device, and front-of-neck access.
- Confirm tracheal placement with continuous waveform capnography, chest rise, auscultation, tube depth, and imaging when appropriate. Reconfirm after every move.
- Motion restriction is individualized. Maintain manual stabilization during high-risk procedures, use a correctly fitted collar when indicated, and remove rigid transfer devices as soon as safely possible to reduce pressure and respiratory harm.

8.3 Breathing and ventilation

Threat	Immediate ED action
Tension pneumothorax	Treat clinically before imaging when haemodynamic instability or severe respiratory compromise is present. Use the locally approved decompression method by a trained clinician, followed by definitive chest drainage.
Open pneumothorax	Apply a vented or three-sided occlusive dressing, monitor for tension physiology, and place a chest drain away from the wound.
Massive haemothorax	Insert large-bore chest drain, activate major haemorrhage, quantify output, and obtain immediate surgical input. Persistent shock or major ongoing output requires operative strategy.
Flail chest / pulmonary contusion	Optimize oxygenation, analgesia, chest physiotherapy and ventilatory support; avoid fluid overload. Intubate for exhaustion, severe hypoxaemia, or inability to protect the airway.
Cardiac tamponade	Suspect with penetrating or blunt chest trauma and shock. Use ultrasound as an adjunct without delaying surgical or resuscitative intervention; needle drainage is a temporizing measure only in selected circumstances.
Traumatic cardiac arrest	Start high-quality resuscitation while immediately treating reversible traumatic causes: catastrophic haemorrhage, hypoxia, bilateral chest decompression, tamponade, and appropriate blood-product resuscitation. Follow the approved traumatic-arrest pathway.

- Use eFAST to augment, not replace, clinical assessment. A negative chest ultrasound does not exclude pneumothorax; repeat examination and imaging when physiology changes.
- Ventilate to normoxia and near-normal carbon dioxide. Avoid routine hyperventilation; temporary controlled hyperventilation is reserved for impending cerebral herniation while definitive treatment is arranged.

8.4 Circulation with haemorrhage control

- Assess pulse quality, BP trend, skin, mental status, capillary refill, shock index, lactate / base deficit, eFAST, abdominal and pelvic findings, long-bone injury, and response to each intervention.
- Assume occult bleeding in chest, abdomen, retroperitoneum / pelvis, long bones, and externally. A normal initial BP or haemoglobin does not exclude major blood loss.
- Use two large peripheral IVs; obtain IO access if needed. Central access must not delay blood transfusion or source control.
- For active major bleeding, prioritize blood components and haemostatic resuscitation over crystalloid. If blood is temporarily unavailable, use small aliquots of warmed balanced crystalloid while expediting blood.
- Reassess after each blood pack or intervention. A transient response suggests ongoing haemorrhage and need for immediate operative or interventional control.

8.5 Disability / neurological status

- Record GCS components, pupils, lateralizing signs, limb movement, glucose, and pre-intubation neurological status. Trend rather than relying on a single total score.
- Treat hypoxia, hypotension, seizures, and hypoglycaemia immediately. Consider intoxication only after traumatic and metabolic causes of altered consciousness have been addressed.

- A falling GCS, new anisocoria, posturing, focal deficit, or seizure requires immediate senior escalation, neuroprotective resuscitation, urgent CT when feasible, and neurosurgical / transfer activation.
- Document analgesia, sedatives, paralytics, and timing because they affect neurological interpretation.

8.6 Exposure and environment

- Fully expose in stages to examine scalp, neck, chest, abdomen, pelvis, perineum, limbs, and back while minimizing heat loss. Inspect under dressings, splints, and clothing.
- Log roll only with adequate staff, clear indication, and team-leader control. Avoid repeated rolls in unstable pelvic, spinal, or penetrating injury.
- Measure core temperature early and serially. Hypothermia worsens coagulopathy and is treated as an active life threat.
- Preserve clothing, projectiles, and other forensic evidence in labelled paper bags where relevant, maintaining chain of custody without compromising clinical care.

9. Monitoring, access, investigations, and resuscitation bundle

Domain	Minimum standard
Continuous monitoring	ECG, SpO ₂ , frequent BP, respiratory rate, temperature; waveform capnography for intubated or deeply sedated patients. Consider arterial pressure monitoring only when it will not delay source control.
Laboratory	Blood gas, lactate / base deficit, ionized calcium, FBC, group and screen / crossmatch, PT/INR, APTT, fibrinogen, electrolytes, creatinine, glucose; add toxicology, CK, troponin, pregnancy testing, and viscoelastic testing as clinically indicated.
Access	Two large peripheral cannulae; IO if delayed. Secure all lines for movement. Use rapid infusion and blood warming for major haemorrhage.
Urine output	Insert urinary catheter only after urethral injury is considered. Blood at meatus, perineal trauma, inability to void, pelvic fracture, or other concern requires senior urological / imaging plan before catheterization.
Gastric decompression	Use orogastric route when basilar skull or major mid-face injury is suspected. Do not delay source control for tube placement.
Reassessment	Repeat <C>ABCDE, GCS, pupils, perfusion, chest findings, abdomen, wounds, splints, binder, distal neurovascular status, temperature, lactate, calcium, and coagulation after major interventions and transfers.

10. Major haemorrhage and damage-control resuscitation

MAJOR HAEMORRHAGE PRINCIPLE: Blood loss is controlled by pressure, packing, tourniquet, binder, surgery, or interventional radiology - not by fluids alone. Resuscitation and source control proceed in parallel.

10.1 Activation and blood components

- Activate from active or suspected major bleeding with shock, transient response, penetrating torso injury, unstable pelvis, major amputation, severe chest / abdominal injury, or senior clinical concern. Do not wait for laboratory confirmation.
- Use the approved adult or paediatric pack and emergency-release blood procedure. In adults, fixed-ratio resuscitation commonly targets plasma and platelets early with red cells, then transitions to laboratory or viscoelastic-guided therapy as soon as feasible.
- Use group-specific blood as soon as safely available. Apply local policy for uncrossmatched O blood, RhD conservation, and patients of child-bearing potential.
- Avoid excessive crystalloid, hydroxyethyl starch, and preventable dilution. Record all blood components, wastage, reactions, and cumulative volume.
- Monitor haemoglobin, platelet count, PT/INR, APTT, fibrinogen, ionized calcium, temperature, acid-base status, and clinical haemostasis; repeat frequently during active bleeding.

10.2 Tranexamic acid, fibrinogen, calcium, and temperature

Intervention	Operational standard
Tranexamic acid - adult	For active bleeding or risk of significant bleeding, give as soon as possible and within 3 hours of injury: 1 g IV over 10 minutes, then 1 g over 8 hours, unless a locally approved alternative applies. Do not delay for coagulation testing.
Tranexamic acid - child	Use the locally approved weight-based paediatric trauma monograph; verify maximum dose and infusion preparation. Do not extrapolate adult volume without pharmacy validation.
Fibrinogen	Treat major bleeding with functional or measured fibrinogen deficit according to local MHP. A Clauss fibrinogen ≤ 1.5 g/L or viscoelastic evidence generally prompts cryoprecipitate or fibrinogen concentrate; dosing must match local products.
Calcium	Measure ionized calcium early and during massive transfusion; maintain in

Intervention	Operational standard
	the normal range, generally ≥ 1.1 mmol/L. Replace promptly using the approved calcium chloride or gluconate monograph and appropriate access.
Temperature	Target normothermia. Use warmed blood / fluids, forced-air warming, blankets, warm environment, reduced exposure, and treatment of wet clothing. Escalate active warming when core temperature is falling or < 35 C.
Acidosis	Restore perfusion and control bleeding; do not use bicarbonate as a substitute for haemorrhage control. Severe persistent acidosis predicts poor clot function and requires urgent source control and critical-care management.

10.3 Blood-pressure targets and vasopressors

- In selected bleeding adults without clinical brain or spinal cord injury, use restricted volume resuscitation with a temporary target SBP approximately 80-90 mmHg until major bleeding is controlled, provided there is a palpable central pulse and acceptable mentation / perfusion.
- In severe TBI, avoid hypotension and maintain cerebral perfusion; a MAP around or above 80 mmHg is commonly targeted while definitive neurotrauma management is arranged. Individualize for age, chronic hypertension, and intracranial monitoring.
- Pregnant patients, children, older adults, and patients with spinal cord injury require individualized perfusion targets and should not be subjected automatically to permissive hypotension.
- Vasopressors do not replace blood and source control. Consider short-term norepinephrine only when profound hypotension persists despite appropriate haemostatic resuscitation or when vasodilation / myocardial dysfunction is contributing, under senior critical-care direction.

10.4 Anticoagulant and antiplatelet management

- Identify anticoagulant, antiplatelet, thrombolytic, and bleeding-disorder history immediately, including last dose, renal function, indication, and available laboratory or drug-level testing.
- Rapidly reverse anticoagulation in major trauma with active or suspected life-threatening bleeding using the approved reversal protocol. Vitamin K antagonist bleeding generally requires 4-factor PCC plus IV vitamin K; DOAC reversal is agent- and availability-specific.
- Do not reverse anticoagulation solely because trauma occurred when there is no active or suspected bleeding; involve haematology / transfusion medicine for complex cases.
- Routine platelet transfusion solely for pre-injury antiplatelet therapy is not recommended without a defined bleeding, procedural, platelet-function, or specialist indication.

11. Rapid source control and destination decision

Likely source	Immediate pathway
External / junctional	Pressure, packing, haemostatic dressing, tourniquet; urgent surgery for uncontrolled bleeding or vascular injury.
Chest	Thoracic decompression / drainage for immediate threats; surgery for massive haemothorax, ongoing major output, tamponade, major airway or vascular injury.
Abdomen	Unstable non-responder with suspected intra-abdominal bleeding: immediate surgical strategy with only essential imaging. Stable / responding patient: urgent contrast CT and surgery / IR according to findings.
Pelvis / retroperitoneum	Binder, MHP, minimize movement; urgent CT if responding, and operative / preperitoneal packing / angioembolization according to physiology, injury pattern, and local capability.
Long bones / limb	Realign gross deformity when neurovascular compromise or skin threat is present, splint, control bleeding, assess compartments, and involve orthopaedics / vascular surgery. Open fractures require antibiotics and tetanus pathway.
Brain / spine	Prevent hypoxia and hypotension, urgent CT, reverse anticoagulation, treat herniation signs, and activate neurosurgical / spinal transfer early.
Uncertain source	Repeat $<C>$ ABCDE and eFAST, inspect back / perineum, verify tube and binder position, assess response to blood, and escalate to senior multidisciplinary decision rather than prolonged undirected testing.

12. Imaging strategy

- Unstable non-responder: limit imaging to what immediately directs intervention, such as chest / pelvis radiography or eFAST, and move rapidly to source control. Do not transport an unstable patient to CT when the result will not change the need for immediate surgery or thoracic intervention.
- Stable or responding adult with blunt suspected multiple injury: perform urgent trauma CT according to the approved whole-body protocol, generally from head / neck through chest, abdomen, and pelvis with limb imaging directed by clinical findings.

- Children: do not routinely use whole-body CT. Use senior clinical judgment and paediatric imaging criteria to target body regions and minimize radiation while avoiding missed injury.
- Penetrating trauma: tailor CT angiography and other imaging to trajectory, anatomy, physiology, and surgical plan; unstable penetrating torso injury usually proceeds directly to operative care.
- FAST / eFAST is an adjunct. A negative study does not exclude intraperitoneal, retroperitoneal, thoracic, or hollow-viscus injury. Repeat when physiology changes and do not use a negative FAST to deny indicated CT.
- Images must be interpreted urgently and critical findings communicated directly to the trauma team leader. Transfer should include images, reports, or secure electronic access.

13. Secondary survey and repeated examination

Begin the secondary survey only after immediate life threats are treated and resuscitation is progressing. It is a head-to-toe examination, not a substitute for repeated primary survey.

Component	Minimum assessment
History	AMPLE: Allergies, Medicines including anticoagulants, Past history / pregnancy, Last meal, Events / environment. Include tetanus, substance use, safeguarding, baseline function, and time of injury.
Head / face	Scalp wounds, skull depression, pupils, ocular injury, ears / nose, dental injury, facial stability, oral cavity, airway contamination, CSF leak.
Neck	Wounds, swelling, trachea, veins, tenderness, neurological symptoms; do not probe penetrating wounds.
Chest	Inspect, palpate, auscultate; reassess tube position, wounds, tenderness, crepitus, symmetry, ECG, and ultrasound / imaging.
Abdomen / flanks	Tenderness, guarding, distension, seatbelt sign, wounds, bruising, serial change; absence of tenderness does not exclude injury in altered patients.
Pelvis / perineum	Binder position, wounds, genital / perineal injury, blood at meatus, rectal or vaginal examination only when specifically indicated and by an appropriate clinician.
Back / spine	Inspect and palpate during a controlled move; document wounds, step deformity, tenderness, sensation, motor function, and priapism / rectal tone only when clinically indicated.
Limbs	Deformity, open wounds, bleeding, pulses, capillary refill, sensation, motor function, compartments, splints, and repeated neurovascular findings.
Neurology	GCS components, pupils, cranial findings, limb movement, sensation, reflexes where relevant, and pre- / post-intervention comparison.

14. Analgesia, sedation, antibiotics, and tetanus

- Assess pain repeatedly using an age- and cognition-appropriate scale. Titrate IV opioid in small aliquots with monitoring; ketamine is useful when hypotension, severe pain, or procedural needs make opioid-heavy treatment undesirable.
- Use regional anaesthesia only by trained clinicians after considering anticoagulation, compartment syndrome, neurological assessment, infection, and haemodynamic stability.
- For open fractures, contaminated wounds, bites, penetrating abdominal injury, and other high-risk patterns, give antibiotics promptly according to the approved injury-specific policy. Do not delay source control for antibiotic selection.
- Assess tetanus immunization and provide vaccine and immunoglobulin when indicated. Document product, dose, and follow-up requirement.
- Procedural sedation requires a dedicated clinician, airway rescue capability, full monitoring, medication checks, and post-sedation recovery criteria. RSI and ongoing ventilation follow the emergency-airway protocol.

15. Injury patterns requiring immediate specialist activation

Pattern	Immediate concern and action
Penetrating neck	Airway, vascular, oesophageal, and neurological injury. Do not explore wounds; control external bleeding, secure airway early if deteriorating, obtain CTA only when stable, and activate surgery / transfer.
Penetrating chest / abdomen	Tamponade, haemothorax, cardiac / great-vessel / visceral injury. Unstable patients require immediate surgical pathway; do not remove impaled objects.
Crush / prolonged entrapment	Hyperkalaemia, rhabdomyolysis, acidosis, compartment syndrome, hypothermia. Start monitoring and metabolic management early, ideally before release in prolonged entrapment.
Blast injury	Primary lung / ear / bowel injury, penetrating fragments, burns, traumatic amputation, contamination, and delayed deterioration. Maintain high suspicion even with limited external findings.
Traumatic amputation	Control haemorrhage, preserve amputated part cool and dry in a sealed bag

Pattern	Immediate concern and action
	placed on ice-water without direct ice contact, give analgesia / antibiotics / tetanus, and activate reimplantation advice where feasible.
Non-accidental / interpersonal injury	Treat injuries first while preserving evidence, documenting objective findings, and activating safeguarding, police, and sexual-assault pathways according to law and patient consent.

16. Traumatic brain injury and spinal-cord protection

- Avoid secondary injury: maintain oxygenation, ventilation, perfusion, normoglycaemia, temperature, and seizure control. Record neurological findings before sedation or paralysis whenever possible.
- Any severe TBI, deteriorating GCS, focal deficit, seizure, skull fracture, anticoagulation, or CT abnormality requires urgent neurosurgical discussion or transfer. Use the linked head-injury protocol for CT and observation criteria.
- When impending herniation is suspected, elevate head if haemodynamics allow, correct hypoxia and hypotension, give locally approved hyperosmolar therapy, and use brief controlled hyperventilation only as a bridge to definitive treatment.
- Suspected spinal cord injury requires careful alignment, repeated motor / sensory documentation, avoidance of hypoxia and hypotension, early spinal consultation, pressure-area protection, and bladder / bowel planning. Neurogenic shock is a diagnosis of exclusion after haemorrhage and thoracic causes are addressed.

17. Special populations

17.1 Children

- Activate paediatric and anaesthetic expertise early. Children may maintain BP until late shock; use age-adjusted physiology, mental status, pulse quality, capillary refill, lactate, and mechanism.
- Use a length- or weight-based system for equipment, drugs, fluids, and blood. Prefer early IO access when peripheral access is difficult. Use weight-based paediatric major-haemorrhage packs and monitor calcium, temperature, and glucose closely.
- Limit CT to clinically indicated regions and use paediatric protocols. Consider non-accidental injury when the history, developmental stage, injury pattern, or delay in presentation is concerning.
- Keep a caregiver present when safe and useful, but do not allow family presence to impede resuscitation. Assign a team member to communicate and support.

17.2 Pregnancy and postpartum

- Maternal resuscitation is the priority and is the best fetal resuscitation. Do not withhold indicated imaging, blood, TXA, surgery, or airway management because of pregnancy.
- After approximately 20 weeks, use left uterine displacement or tilt without compromising spinal precautions. Anticipate difficult airway, rapid desaturation, aspiration, and increased blood volume masking early shock.
- Activate obstetrics and neonatal services early. Begin fetal assessment after maternal stabilization when gestation and resources permit. Evaluate for placental abruption, fetomaternal haemorrhage, uterine rupture, and preterm labour.
- Provide RhD immunoglobulin and fetomaternal-haemorrhage testing according to local obstetric policy. Consider perimortem / resuscitative delivery in maternal arrest according to the maternal-resuscitation protocol.

17.3 Older adults, frailty, and anticoagulation

- Low-energy falls can cause major intracranial, cervical, chest, pelvic, and hip injury. Avoid under-triage based on mechanism alone; integrate frailty, baseline function, comorbidity, and medication risk.
- Beta-blockers and pacemakers may blunt tachycardia. Chronic hypertension changes the significance of "normal" BP. Early CT, medication reconciliation, anticoagulant reversal assessment, and delirium prevention are often required.
- Goals of care and treatment ceilings should be clarified early without allowing age or disability alone to restrict indicated emergency treatment. Involve the patient and surrogate whenever time permits.

18. Disposition

Destination	Minimum criteria
Operating theatre / interventional radiology	Active bleeding or injury requiring immediate procedural control; transfer directly with resuscitation continuing and senior acceptance.
Critical care / high-dependency	Ventilated patient, ongoing vasoactive or transfusion requirement, severe TBI, unstable physiology, major thoracic / abdominal / pelvic injury, significant metabolic disturbance, or need for close organ support.
Specialist ward	Definitive injury plan, stable physiology, completed tertiary-survey plan, analgesia, thromboprophylaxis and monitoring orders, and named responsible service.
Observation / short stay	Only for selected stable patients after senior review, with defined injury, serial examination, investigation plan, reassessment intervals, and escalation criteria.
Transfer	Required specialist or definitive capability unavailable locally; acceptance, transport, escort, monitoring, blood / medication supply, imaging, and contingency plan confirmed.
Discharge	Not appropriate after major trauma unless serious injury has been excluded, the patient is stable and ambulant as appropriate, pain and function are manageable, cognition is reliable, safeguarding is addressed, and written follow-up / return precautions are provided.

19. Transfer and handover

- Activate transfer as soon as the need is recognized; stabilization and referral occur in parallel. Early transfer is particularly important for neurosurgery, vascular / cardiothoracic surgery, interventional radiology, complex paediatric trauma, spinal cord injury, and major burns.
- Obtain receiving-clinician acceptance and agree the destination, urgency, required interventions before departure, and treatments that must continue during transport.
- The escort must be able to manage airway loss, tension pneumothorax, recurrent haemorrhage, shock, arrhythmia, seizures, and cardiac arrest. Provide adequate oxygen, suction, ventilator, monitors, pumps, warming, blood products, medications, and procedure equipment.
- Use ATMIST / SBAR handover with mechanism and time, injuries, trends, interventions and response, blood and TXA, airway / chest procedures, binder / tourniquet times, imaging, laboratory trends, anticoagulation, pregnancy, safeguarding, and outstanding risks.
- Send records, imaging and reports, medication chart, blood-product documentation, consent / capacity information, next-of-kin details, and forensic materials according to policy. Document departure observations and responsibility transfer.

20. Documentation, communication, and family support

- Document the pre-alert, handover, exact injury time if known, mechanism, protective equipment, entrapment, treatment before arrival, and initial physiology.
- Record each <C>ABCDE cycle, vital trend, GCS components, pupils, wounds, procedures, medication, blood component, dose / unit, time, response, imaging, consultation, and destination decision.
- Document tourniquet and pelvic-binder application time and site, chest-drain findings and output, airway confirmation, urine output, temperature, calcium, lactate, and coagulation trends.
- Use closed-loop communication for critical orders. The team leader performs regular summaries and a final pre-departure or pre-handover check.
- Assign a clinician or liaison to update family in plain language, verify identity and contact, explain uncertainty, and support viewing or bereavement when appropriate. Protect confidentiality and patient preferences.
- When injury may be intentional, occupational, traffic-related, or subject to legal investigation, document objective findings and preserve evidence while maintaining clinical priority.

21. Death in the emergency department

- Follow the approved traumatic-cardiac-arrest and death-verification protocols. Consider whether all reversible traumatic causes and appropriate resuscitative interventions have been addressed.
- Notify the coroner / medical examiner, police, safeguarding service, transplant / tissue service, and hospital leadership as required by law and policy.
- Preserve lines, tubes, clothing, and evidence when a medicolegal investigation is likely unless removal is clinically or legally authorized. Record all devices and interventions.
- Provide compassionate family communication, private space, cultural and spiritual support, property management, and staff debriefing. Every traumatic death should enter structured mortality and preventability review.

22. Quality indicators and audit

Indicator	Suggested measure
Activation	Proportion meeting criteria with trauma team activated before or immediately on arrival; under-triage and over-triage review.
Senior leadership	Time from arrival to trauma team leader and surgical / anaesthetic

Indicator	Suggested measure
	attendance.
Haemorrhage control	Time to tourniquet / binder / chest decompression / MHP; time to first blood; time to operating theatre or embolization.
TXA	Eligible patients receiving TXA within 3 hours and time from arrival to dose.
Resuscitation quality	Temperature, ionized calcium, lactate, fibrinogen, blood ratios, crystalloid volume, and documented repeated <C>ABCDE.
Imaging	Time to CT and critical report; unstable patients delayed in CT; missed injury and unplanned return to imaging / theatre.
Transfer	Time from decision to referral, acceptance, departure, and definitive-care arrival; adverse events and equipment / documentation failures.
Outcome	24-hour and in-hospital mortality, unexpected ICU admission, unplanned intubation, massive transfusion, complications, functional disposition, and preventability review.
Experience and equity	Family communication, pain treatment, safeguarding, language access, and evidence of age-, sex-, disability-, or geography-related under-triage.

23. Training and implementation

- Run recurring multidisciplinary simulation for blunt and penetrating trauma, paediatric trauma, pregnancy, traumatic arrest, difficult airway, massive haemorrhage, CT deterioration, and inter-facility transfer.
- Use standardized trauma-bay layout, role cards, checklists, pre-packed haemorrhage and thoracostomy equipment, paediatric aids, pelvic binders, warming devices, and transfer kits. Check readiness each shift.
- Conduct blood-bank and operating-theatre drills, including emergency-release blood, component pack turnaround, calcium and TXA availability, transfusion-reaction response, and product conservation during supply constraints.
- Review all traumatic deaths, major delays, airway complications, missed injuries, MHP activations, unplanned transfers, and serious deviations through the trauma performance-improvement process.
- Revalidate staff competencies for RSI, chest decompression, chest drainage, ultrasound, IO access, tourniquet and wound packing, pelvic binder, rapid infusion, and paediatric dosing.

ANNEX A. One-page major-trauma workflow

Step	Action
PRE-ALERT	Receive ATMIST; activate team and specialists; prepare airway, haemorrhage, warming, blood, ultrasound, CT / theatre / transfer.
<C>	Control catastrophic bleeding: pressure, packing / haemostatic dressing, tourniquet, pelvic binder.
A	Open / suction airway with spinal protection; oxygenate; RSI if needed; difficult-airway and failed-airway plans; capnography confirmation.
B	Assess chest; treat tension pneumothorax before imaging when unstable; manage open pneumothorax / haemothorax; ventilate appropriately.
C	Two IVs or IO; labs and blood gas; activate MHP; early blood, TXA within 3 h, calcium and warming; find and control source.
D	GCS components, pupils, glucose, focal signs; prevent hypoxia / hypotension; herniation rescue and neurosurgical transfer if indicated.
E	Expose in stages, temperature control, back / perineum / limbs, splinting, forensic preservation.
DECIDE	Non-responder -> minimum imaging and immediate source control. Responder / stable -> urgent CT. Identify definitive destination and activate transfer early.
REPEAT	Repeat <C>ABCDE after each procedure, during transport, after CT, and with any deterioration. Complete secondary and tertiary survey plan.

ANNEX B. Trauma-team activation quick card

- Physiology: airway compromise; severe respiratory distress; SBP <90 or age-adjusted hypotension; shock index approximately ≥ 0.9 ; GCS ≤ 8 or fall ≥ 2 ; active major bleeding; need for ventilation; peri-arrest.
- Anatomy: penetrating neck / torso; unstable chest; suspected pelvic fracture with shock; amputation; major vascular injury; two or more proximal long-bone fractures; spinal cord deficit; severe crush; major open fracture; burns with trauma.
- Mechanism / risk: ejection, death in same vehicle, high-energy fall, pedestrian / cyclist struck, high-speed collision, blast, prolonged entrapment, anticoagulation, pregnancy, child, frailty, or senior concern.
- Upgrade immediately for deterioration or new high-risk information. Local activation must favour sensitivity where transfer times are long or specialist capability is limited.

ANNEX C. Primary-survey prompt card

Letter	Say and do
<C>	"Catastrophic bleeding?" Inspect, pressure, pack, tourniquet, binder, MHP.
A	"Airway patent? Cervical risk?" Suction, adjunct, oxygenate, RSI plan, capnography.
B	"Chest life threat?" Look, feel, listen, ultrasound; decompress / drain before imaging when indicated.
C	"Shock? Where is the blood?" Access, blood gas, blood products, TXA, calcium, warmth, source control.
D	"GCS components, pupils, glucose, focal sign?" Treat hypoxia / hypotension / seizure; neurotrauma plan.
E	"What have we not seen? Temperature?" Full staged exposure, back / perineum / limbs, warm, preserve evidence.
REVIEW	State response to treatment, likely injuries, unresolved threats, and immediate destination.

ANNEX D. Major-haemorrhage checklist

- Activate MHP and identify adult / paediatric pack; notify blood bank of location and responsible clinician.
- Control source: pressure / packing / tourniquet / binder / thoracic procedure / surgery / IR.
- Give emergency blood; minimize crystalloid; use warmer and rapid infuser; track each unit.
- Give TXA within 3 hours when indicated; document injury time, loading dose, and infusion.
- Monitor and correct ionized calcium, temperature, fibrinogen, platelets, coagulation, acidosis, and glucose.
- Reverse anticoagulation when life-threatening bleeding is active or suspected.

- Reassess response and destination after every pack. Stop or stand down MHP explicitly and notify blood bank.

ANNEX E. Adult haemostatic-resuscitation safety card

Issue	Safety point
Blood pressure	Temporary SBP 80-90 mmHg may be acceptable before bleeding control only in selected adults without TBI / spinal injury. Avoid organ hypoperfusion.
TXA	1 g IV over 10 min then 1 g over 8 h, within 3 h of injury; use approved monograph and renal / seizure precautions.
Calcium	Trend ionized calcium; aim normal, generally ≥ 1.1 mmol/L. Use local calcium chloride / gluconate dosing and appropriate vascular access.
Fibrinogen	Treat ≤ 1.5 g/L or functional deficit with local cryoprecipitate / fibrinogen protocol.
Temperature	Warm patient, room, blood, and fluids; actively treat < 35 C.
Laboratory	Repeat blood gas, lactate, haemoglobin, platelets, INR / APTT, fibrinogen, calcium; use TEG / ROTEM if available.
Stop rule	Once haemostasis is achieved and bleeding risk falls, transition from empirical packs to goal-directed care and avoid unnecessary components.

ANNEX F. Imaging and destination card

Patient state	Imaging / destination
Unstable non-responder	Treat reversible chest causes; minimum radiography / eFAST only if it directs intervention; immediate theatre / IR / transfer.
Transient responder	Assume ongoing bleeding. Rapid senior decision between CT and direct source control; CT only if it will change and not dangerously delay definitive treatment.
Stable / responding adult blunt polytrauma	Urgent trauma CT / whole-body protocol; direct specialist review of critical findings.
Child	Targeted CT by region; avoid routine whole-body CT; use paediatric criteria and senior review.
Penetrating torso	Unstable -> operative pathway. Stable -> trajectory-directed CT / CTA and surgical plan.
Capability unavailable	Activate receiving centre before completing non-essential tests. Send images and reports; continue resuscitation during transfer preparation.

ANNEX G. Secondary-survey checklist

- AMPLE history and full mechanism; allergies; anticoagulants; pregnancy; tetanus; baseline function and frailty.
- Head / face / eyes / ears / mouth; neck; chest; abdomen / flanks; pelvis / perineum; back / spine; all limbs; skin and wounds.
- Repeat GCS, pupils, motor / sensory findings, pain score, temperature, and distal neurovascular status.
- Review all lines, tubes, drains, tourniquets, binder, splints, dressings, imaging, labs, medication, blood products, and urine output.
- Create a tertiary-survey plan within 24 hours or after awakening to detect missed injury; document responsibility.

ANNEX H. Transfer minimum dataset

- Identity, age / weight, pregnancy, next of kin, safeguarding and consent / capacity status.
- Incident time, mechanism, scene findings, entrapment, protective equipment, pre-hospital course.
- Injuries suspected / confirmed, serial vital signs, <C>ABCDE findings, GCS components and pupils.
- Airway device and depth, ventilation, chest procedures, drains and output, lines, tourniquet and binder times.
- Blood components and totals, TXA, calcium, fluids, vasopressors, analgesia, sedation, antibiotics, reversal agents.
- Laboratory trends, imaging and reports, allergies, medicines, comorbidities, outstanding tests and immediate risks.
- Receiving clinician, destination, transport mode, escort, equipment, oxygen, blood supply, contingency plan, departure observations.

ANNEX I. Paediatric safety card

- Use age-adjusted vital signs and weight / length-based equipment and dosing. Hypotension is late.
- Early IO if IV access is difficult; weight-based blood components; frequent glucose, calcium, temperature, and perfusion reassessment.
- Targeted CT rather than routine whole-body CT. Use paediatric surgical / anaesthetic advice and safeguarding review.
- Provide caregiver communication and age-appropriate analgesia while preserving resuscitation space and team function.

ANNEX J. Pregnancy trauma card

- Maternal <C>ABCDE first; left uterine displacement after mid-pregnancy; avoid hypoxia and hypotension.

- Do not delay indicated CT, blood, TXA, surgery, or transfer. Alert obstetrics, anaesthesia, neonatal services, and blood bank.
- After stabilization: fetal monitoring as appropriate, assess placental abruption and labour, RhD / fetomaternal-haemorrhage pathway.
- Maternal arrest: follow pregnancy-specific resuscitation and resuscitative-delivery pathway.

ANNEX K. Trauma audit tool

Audit field	Record
Activation	Criteria, level, pre-alert time, team arrival times, upgrade / downgrade and rationale
Primary survey	Arrival and repeated <C>ABCDE times; first complete vital set; GCS / pupils; temperature
Airway / breathing	Oxygen, intubation, capnography, chest decompression / drain and indication / time
Haemorrhage	MHP time, first blood, TXA, calcium, fibrinogen, tourniquet / binder, crystalloid volume, source-control time
Imaging / definitive care	CT start / report, theatre / IR / transfer decision and arrival
Outcome	ICU, operation, transfer, complications, missed injury, mortality, preventability, functional disposition
Learning	Delays, equipment / staffing issues, communication, equity / safeguarding, actions and accountable owner

ANNEX L. Local configuration checklist

- Approved adult and paediatric activation criteria, call tree, trauma-team roles, and escalation / stand-down authority.
- Airway, failed-airway, chest decompression, chest drain, traumatic-arrest, and spinal-motion policies.
- Adult and paediatric major-haemorrhage packs, emergency blood issue, RhD policy, TXA, calcium, fibrinogen, DOAC reversal, and blood warmer / rapid infuser.
- CT access, trauma CT protocol, radiology reporting, ultrasound competence, operating theatre, interventional radiology, and neurosurgical / specialist referral.
- Paediatric, obstetric, safeguarding, forensic, infection-control, mass-casualty, and death-in-ED pathways.
- Ground, sea, and air transfer destinations, acceptance numbers, escort standards, blood / oxygen carriage, weather and after-hours contingency.
- Training calendar, simulation schedule, equipment checks, audit dashboard, mortality-review process, and document review date.

ANNEX M. References and source tools

- National Institute for Health and Care Excellence. Major trauma: assessment and initial management (NG39). Recommendations and current resource set.
- Rossaint R, Afshari A, Bouillon B, et al. The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition. Critical Care. 2023;27:80.
- American College of Surgeons Trauma Quality Programs. Best Practices Guidelines: The Management of Traumatic Brain Injury. Revised 2024.
- World Health Organization and International Committee of the Red Cross. Basic Emergency Care: Approach to the Acutely Ill and Injured. WHO; 2018.
- Brain Trauma Foundation. Guidelines for the Management of Severe Traumatic Brain Injury and current updates.
- Local transfusion service major-haemorrhage protocol, formulary and reversal monographs, paediatric references, trauma imaging protocols, operative / interventional capability, and transfer agreements must govern final implementation.