



CG006 Major Trauma

1. Key Recommendations for operational use		
1	Mechanism	<ul style="list-style-type: none"> • Assess scene for information on mechanism of injury. • Use spinal immobilisation precautions as indicated by mechanism. • For patients with isolated head injury follow CG005 Head Injury.
2	Catastrophic haemorrhage	<ul style="list-style-type: none"> • If absent carotid pulse, follow: CG002 Traumatic Cardiac Arrest. • Control external haemorrhage using direct pressure +/- dressings +/- tourniquet: <ul style="list-style-type: none"> - use a tourniquet only if direct pressure fails. - consider a second, more proximal tourniquet if haemorrhage control is inadequate. - record time of tourniquet application.
3	Airway	<ul style="list-style-type: none"> • If the patient is unable to maintain their airway or has inadequate ventilation then induce anaesthesia as soon as practicable as per CG007 Emergency Anaesthesia.
4	Breathing	<ul style="list-style-type: none"> • Titrate oxygen to maintain oxygen saturations of 94-98%. • Consider chest ultrasound to augment clinical assessment, but do not delay transfer. • Decompress a suspected or confirmed pneumothorax if there is haemodynamic instability or respiratory failure: <ul style="list-style-type: none"> - use a needle technique in awake patients and an open thoracostomy when ventilated. - do not cover the open thoracostomy sites. • Consider prophylactic antibiotics in patients requiring open thoracostomy. • Cover an open pneumothorax with an occlusive dressing or chest seal. • With a haemothorax, consider a chest drain but do not prolong scene time. • For painful chest trauma in patients not requiring anaesthesia, give appropriate analgesia. <ul style="list-style-type: none"> - sit upright if there is no indication for spinal immobilisation.
5a	Circulation (fluid therapy)	<ul style="list-style-type: none"> • Secure two points of wide bore IV access. <ul style="list-style-type: none"> - use intra-osseous access if IV access is not feasible. • In haemorrhagic shock, consider blood (if available) as the resuscitation fluid. • In children, use fluid boluses of 5-10ml/kg. • Consider permissive hypotension: <ul style="list-style-type: none"> - do not permit hypotension in children. - do not permit hypotension with significant head injury. - do not permit hypotension in pregnancy. - withhold fluid if systolic blood pressure is greater than 90mmHg, radial pulse is palpable or the patient is alert.



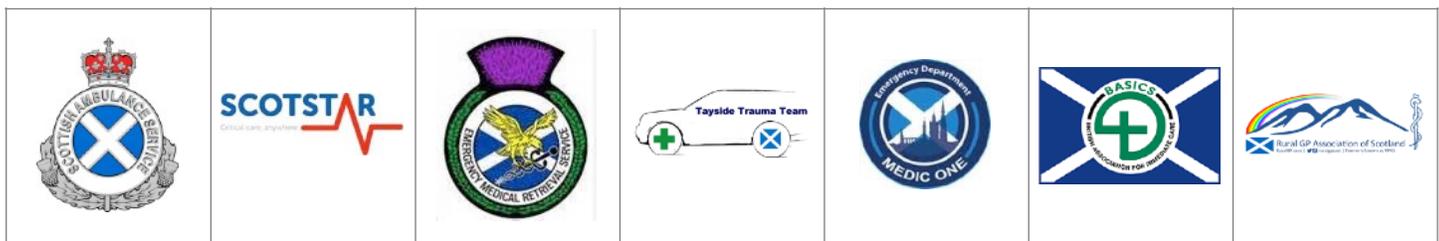
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5b	Circulation (other interventions)	<ul style="list-style-type: none"> • Administer 1g tranexamic acid to adults (15mg/kg in children) if suspected active bleeding and no contra-indications. <ul style="list-style-type: none"> - avoid tranexamic acid if time since injury is greater than 3 hours. • Give 10% calcium chloride 10mls (0.1ml/kg) if more than one unit of packed red blood cells has been administered. • Consider eFAST but do not delay transfer. • Apply a pelvic binder if suspected pelvic fracture or haemorrhagic shock without other cause.
6	Limbs	<ul style="list-style-type: none"> • Reduce and splint displaced fractures to anatomical position. • Use femoral traction splints if indicated only after placing a pelvic binder. • With an open fracture: <ul style="list-style-type: none"> - give antibiotics (IV/IO) as soon as possible and ideally within an hour of injury. - attempt reduction to anatomical position - cover with saline soaked gauze - ensure haemostasis • Cover amputated parts in saline soaked gauze, place in a plastic bag then immerse in iced water if available.
7	Packaging	<ul style="list-style-type: none"> • Ensure patient packaging minimises risks of equipment snags, pressure sores and hypothermia.
8	Other considerations	<ul style="list-style-type: none"> • Check blood glucose. • Optimise pain relief with intravenous analgesia.
9	In-hospital considerations	<ul style="list-style-type: none"> • Consider imaging as locally available and feasible. • Consider laboratory or point of care blood analysis as locally available. • If balanced blood product resuscitation is locally available: <ul style="list-style-type: none"> - use a ratio of 1 part packed red blood cells to 1 part FFP. - after 20ml/kg of packed red blood cells or blood products, give 10ml/kg platelets.
10	Triage	<ul style="list-style-type: none"> • Triage appropriately using SAS major trauma and paediatric major trauma triage tools: <ul style="list-style-type: none"> - take patients to an MTC if within 45 minutes transport time.
11	Communication	<ul style="list-style-type: none"> • Pre-alert receiving centre, consider using an 'ATMIST' handover format. • Give a 'Code Red' pre-alert with haemorrhagic shock. • Ensure all documentation completed.



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2. Document History			
Reference Number	CG006		
Version	2		
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	Medic 1		✓
	Referring centres via service websites		✓
	Rural GPs Association of Scotland		✓
	SAS	Air Ambulance	✓
		Specialist Services Desk	for information
	ScotSTAR	EMRS West	✓
		EMRS North	✓
		Paediatric	✓
		Neonatal	X
Tayside Trauma Team		✓	





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3. Scope and purpose

- Overall objectives:

The aim of this guideline is to provide guidance in the clinical management of a major trauma patient. It is designed to be used in patients with single and multiple system injury and considers a range of operational environments, resources and personnel.

- Statement of intent:

This guideline is not intended to be construed or to serve as a standard of care. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. Clinicians using this guideline should work within their skill sets and usual scope of practice.

- Feedback:

Comments on this guideline can be sent to: sas.cpg@nhs.scot

- Equality Impact Assessment:

Applied to the ScotSTAR Clinical Standards group processes.

- Guideline process endorsed by the Scottish Trauma Network Prehospital, Transfer and Retrieval group.





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4. Explanatory Statements		
4.1 Mechanism	Authors' recommendation	Reference
<ul style="list-style-type: none"> Assess scene for information on mechanism of injury. <p>A scene can give information regarding patient injury patterns and energy forces although the predictive value in isolation has been questioned [3].</p>	Conditional	1,2,3
<ul style="list-style-type: none"> Use spinal immobilisation precautions as indicated by mechanism. <p>Do not compromise the airway to undertake cervical spine control.</p>	Strong	1,4,5
<ul style="list-style-type: none"> For patients with isolated head injury follow CG005 Head Injury. 		
4.2 Catastrophic haemorrhage		
<ul style="list-style-type: none"> If absent carotid pulse, treat as a traumatic cardiac arrest: CG002 Traumatic Cardiac Arrest. 	Strong	6
<ul style="list-style-type: none"> Control external haemorrhage using direct pressure +/- dressings +/- tourniquet: <ul style="list-style-type: none"> use a tourniquet only if direct pressure fails. consider a second, more proximal tourniquet if haemorrhage control inadequate. record time of tourniquet application. <p>Use haemostatic dressings or modular blast bandages to control external bleeding. Use a tourniquet to control life-threatening major haemorrhage if direct pressure fails. Place proximal to the point of bleeding but as close to the wound as possible. A tourniquet can be placed over an area with two bones (forearm and lower leg) as long as haemorrhagic control is adequate. Place a second tourniquet, more proximally if haemorrhage control is inadequate. A tourniquet is considered to be adequate if there is no pulse present distal to the tourniquet. Use analgesia or sedation as required.</p>	Strong	1,2,7
4.3 Airway		
<ul style="list-style-type: none"> If the patient is unable to maintain their airway or has inadequate ventilation then induce anaesthesia as soon as practicable as per CG007 Emergency Anaesthesia. <p>Anaesthesia should be performed ideally within 45 minutes of 999 call and preferably on scene. If anaesthesia cannot be performed consider using basic airway manoeuvres and adjuncts, a supraglottic airway (LMA / iGel) or a surgical airway as required.</p>	Strong	2,8



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4.4 Breathing	Authors' recommendation	Reference
<ul style="list-style-type: none"> <i>Titrate oxygen to maintain saturations of 94-98%.</i> <p>All major trauma patients should be initiated on high flow oxygen. Oxygen should then be titrated down to maintain saturations of 94-98%.</p>	Strong	6,9,10
<ul style="list-style-type: none"> <i>Consider chest ultrasound to augment clinical assessment, but do not delay transfer.</i> <p>A negative eFAST does not exclude a pneumothorax.</p>	Conditional	8,9
<ul style="list-style-type: none"> <i>Decompress a suspected or confirmed pneumothorax if there is haemodynamic instability or respiratory failure:</i> <p>Patients who are haemodynamically stable with no signs of respiratory distress should be transported to hospital without chest decompression. If decompression is performed, reassess post procedure for signs of recurrence.</p>	Strong	8,9,21
<ul style="list-style-type: none"> <i>use a needle technique in awake patients.</i> <p>For needle decompression use an ARS (Air Release System) needle, an equivalent or a wide bore cannula in the 2nd intercostal space mid-clavicular line. If unsuccessful repeat the procedure in the 5th intercostal space mid-axillary line using an IV cannula.</p>		
<ul style="list-style-type: none"> <i>use an open thoracostomy when ventilated.</i> <i>do not cover the open thoracostomy sites.</i> <p>In ventilated patients, open thoracostomy (4th-5th intercostal space just anterior to the mid-axillary line) is preferred. Do not perform open thoracostomy in spontaneously ventilating patients. It is potentially unsafe to cover an open thoracostomy site with a chest seal due to the risk of the seal blocking and development of a tension pneumothorax. Ensure when packaging that the thoracostomy sites are not covered, to prevent blockage. If the patient deteriorates then 're-finger' the tract made in the thoracostomy site.</p>		
<p>Insertion of chest drains in the pre-hospital environment can prolong scene time, kink, block or become dislodged during transfer and are difficult to perform in a sterile fashion. However, chest drains can be considered in spontaneously breathing, haemodynamically unstable patients with respiratory compromise and signs of a large pneumothorax or haemothorax (below), when general anaesthesia is not indicated.</p>		
<ul style="list-style-type: none"> <i>Consider prophylactic antibiotics in patients requiring open thoracostomy.</i> <p>Antibiotics should be considered in penetrating chest trauma or when transport time may exceed three hours. Cefotaxime, Cefuroxime or Co-Amoxiclav would be appropriate choices.</p>	Conditional	6,8,9



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4.4 Breathing, continued.	Authors' recommendation	Reference
<ul style="list-style-type: none"> Cover an open pneumothorax with an occlusive dressing or chest seal. 'Three-sided dressings' are not recommended. If the patient becomes haemodynamically unstable or shows signs of respiratory distress, then tension pneumothorax should be suspected and any dressings removed immediately. If this fails to improve patient condition, perform chest decompression. 	Strong	8,9
<ul style="list-style-type: none"> With a haemothorax, consider a chest drain but do not prolong scene time. This diagnosis in an unstable patient may be very difficult. While a chest drain may be helpful in assessment of blood loss and prevention of tension pneumothorax, insertion may dislodge blood clots and cause further haemorrhage and so should ideally be performed at the receiving trauma centre. 	Conditional	9
<ul style="list-style-type: none"> For painful chest trauma in patients not requiring anaesthesia, give appropriate analgesia. <ul style="list-style-type: none"> sit upright if there is no indication for spinal immobilisation. <p>There is no evidence to support manual splintage of flail rib fractures. Upright positioning will aid effective spontaneous ventilation by improving comfort and potentially better ventilation/perfusion respiratory physiology. Optimal parenteral analgesia may reduce likelihood of requirement for invasive ventilation, however if despite the measures above there is a failure of oxygenation and/or ventilation, emergency anaesthesia may be indicated (CG007 Emergency Anaesthesia).</p>	Strong	9
4.5a Circulation (fluid therapy)		
<ul style="list-style-type: none"> Secure two points of wide bore IV access. <ul style="list-style-type: none"> use intra-osseous access if IV access is not feasible. 	Strong	1
<ul style="list-style-type: none"> In haemorrhagic shock consider blood (if available) as resuscitation fluid. Balanced resuscitation combined with haemostasis is the standard approach in hospital [2]. A meta-analysis of heterogenous non-randomised studies did not show any benefit of pre-hospital transfusion [23] however a subsequent retrospective study with cofounder correction demonstrated a survival benefit in the military setting [11]. A recent UK civilian randomised controlled trial of prehospital blood products in adults did not demonstrate any difference in outcomes between initial blood product or saline resuscitation [24]. 	Conditional	2,11,23,24
<ul style="list-style-type: none"> In children, use fluid boluses of 5-10ml/kg. 	Strong	12



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4.5a Circulation (fluid therapy), continued.	Authors' recommendation	Reference
<ul style="list-style-type: none"> Consider permissive hypotension: 		
<ul style="list-style-type: none"> do not permit hypotension in children. <p>Fluid resuscitation in paediatric trauma is challenging and under-recognition of shock is common. There is a lack of evidence supporting permissive hypotension in children. Hypotension is often a late and ominous sign due to their significant cardiac reserve.</p>	Strong	12,13,14
<ul style="list-style-type: none"> do not permit hypotension with significant head injury. <p>In patients with severe head injury, maintain an adequate cerebral perfusion pressure to prevent secondary brain injury (CG005 Head Injury).</p>	Strong	2,6
<ul style="list-style-type: none"> do not permit hypotension in pregnancy. <p>Hypotension is a late sign of hypovolaemia in pregnancy; limited reliance should be placed on blood pressure.</p>	Conditional	17,22
<ul style="list-style-type: none"> withhold fluid if systolic blood pressure is greater than 90mmHg, radial pulse is palpable or the patient is alert. <p>Permissive hypotension is thought to reduce further bleeding by preventing dilution of clotting factors and the disruption of formed blood clots.</p>	Strong	1,2,6
<p>4.5b Circulation (other interventions).</p>		
<ul style="list-style-type: none"> Administer 1g of tranexamic acid to adults (15mg/kg in children) if suspected active bleeding and no contraindications. avoid tranexamic acid if time since injury is greater than 3 hours. <p>Give a further infusion of 1g of tranexamic acid over 8 hours if starting this will not delay transfer to hospital. Tranexamic acid is an antifibrinolytic agent, and has been found to improve morbidity and mortality of bleeding trauma patients if given within 3 hours of time of injury, however is likely to be ineffective if given after 3 hours. The earlier it is given in trauma the more likely it is to have a beneficial effect. The role of tranexamic acid in isolated head injury is discussed in CG005 Head Injury.</p>	Strong	8,15
<ul style="list-style-type: none"> If more than one unit of packed red blood cells administered, give 10mls of 10% calcium chloride (0.1ml/kg). <p>Major trauma patients are likely to be hypocalcaemic, particularly after blood transfusion and this may be associated with increased mortality. Administration should not delay transfer to hospital.</p>	Conditional	2,16,17
<ul style="list-style-type: none"> Consider eFAST but do not delay transfer <p>Ultrasound assessment of the chest and abdomen may identify pneumothorax, cardiac tamponade or blood in the abdomen or chest. This may guide resuscitation strategy and will be useful information for receiving centres. There is no good evidence for prehospital pericardiocentesis.</p>	Conditional	2,8,9



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4.5b Circulation (other interventions) - continued	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> Apply a pelvic binder if suspected pelvic fracture or haemorrhagic shock without other cause. <p>Apply at level of greater trochanters directly onto skin and do not remove until patient has had appropriate imaging. Try to minimise patient handling to avoid disrupting possible blood clot within the pelvis. Do not “spring” the pelvis for the same reason.</p> <p>In the case of lateral (shear) fractures a pelvic binder may worsen the fracture; it is important to think about the mechanism of injury. However, if in doubt apply a pelvic binder.</p>	Strong	1,2,18
<h3>4.6 Limbs</h3>		
<ul style="list-style-type: none"> Reduce and splint displaced fractures to anatomical position. <p>This will require appropriate parenteral analgesia or sedation depend on clinician skill set. Examine for and document distal pulses and sensation before and after reduction.</p>	Strong	1,5,6
<ul style="list-style-type: none"> Use femoral traction splints if indicated, only after placing a pelvic binder. <p>This may not be possible (e.g. significantly displaced tibia / fibula fractures, partial / full amputations etc.), consider using a box splint in these situations.</p>	Strong	1,5
<ul style="list-style-type: none"> With an open fracture: <ul style="list-style-type: none"> give antibiotics (IV/IO), as soon as possible and ideally within an hour of injury <p>There is a high incidence of infection in open fractures. Provide antibiotic cover with a broad spectrum antibiotic such as cefuroxime or cefotaxime.</p>	Strong	19
<ul style="list-style-type: none"> attempt reduction to anatomical position cover with saline soaked gauze ensure haemostasis 	Strong	6
<ul style="list-style-type: none"> Cover amputated parts in saline soaked gauze, place in a plastic bag then immerse in iced water if available. <p>This can help preserve the amputated tissue. There are some situations in which amputated parts can be re-attached and as such they should be transported with the patient to the receiving hospital.</p>	Strong	1



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4.7 Packaging	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Ensure patient packaging minimises risks of equipment snags, pressure sores and hypothermia</i> <p>Movement of patients increases pain and can disrupt blood clots and increasing haemorrhage. Hypothermia worsens metabolic acidosis and patient outcome. Minimise heat loss using warmed resuscitation fluid, foil blankets, bubble-wrap and vacuum mattresses if available.</p>	Strong	1,4,18
4.8 Other considerations		
<ul style="list-style-type: none"> • <i>Check blood glucose in patients with altered mental status.</i> 	Strong	6
<ul style="list-style-type: none"> • <i>Optimise pain relief with intravenous analgesia</i> 	Strong	6,8
4.9 In-hospital considerations		
<ul style="list-style-type: none"> • <i>Consider imaging as locally available and feasible.</i> 	GPP	
<ul style="list-style-type: none"> • <i>Consider laboratory or point of care blood analysis as locally available.</i> 	GPP	
<ul style="list-style-type: none"> • <i>If balanced blood product resuscitation is locally available:</i> <ul style="list-style-type: none"> - <i>use a ratio of 1 part packed red blood cells to 1 part FFP.</i> - <i>after 20ml/kg of packed red blood cells or blood products, give 10ml/kg platelets (if available).</i> 	Strong	8,2,12,14
4.10 Triage		
<ul style="list-style-type: none"> • <i>Triage appropriately using SAS major trauma and paediatric major trauma triage tools.</i> 	Strong	20
<ul style="list-style-type: none"> • <i>Take patients to an MTC if within 45 minutes transport time.</i> <p>If greater than 45 minute transfer, contact the trauma desk to discuss helicopter retrieval, pre-hospital team rendezvous or diversion to local trauma unit. If patient does not trigger trauma tool then transfer to local ED.</p>	GPP	
4.9 Communication		
<ul style="list-style-type: none"> • <i>Pre-alert receiving centre, consider using an 'ATMIST' handover format.</i> 	Strong	20
<ul style="list-style-type: none"> • <i>Ideally a pre-alert should be between the prehospital team and the trauma team leader.</i> 	Conditional	20
<ul style="list-style-type: none"> • <i>Give a 'Code Red' pre-alert with haemorrhagic shock.</i> 	GPP	
<ul style="list-style-type: none"> • <i>Ensure all documentation is completed.</i> <p>Records should be accurate and up to date; information gathered at scene is very helpful to all those involved subsequent patient care.</p>	GPP	



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5. References

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