

	1. Key Recommendations for operational use				
1	Mechanism	Assess scene for mechanism of injury and energy forcesUse spinal immobilisation precautions as indicated by mechanism			
2	 Catastrophic haemorrhage If absent carotid pulse use CG002 Traumatic Cardiac Arrest Control external haemorrhage: apply direct pressure use a haemostatic dressing or modular blast bandages to control external bleeding apply a limb tourniquet where appropriate 				
3	Airway	 induce anaesthesia in patients who cannot maintain their airway or ventilation: anaesthesia should be performed as soon as possible, ideally within 45 minutes of initial 999 call and preferably at the scene induce anaesthesia according to CG007 Emergency Anaesthesia if anaesthesia cannot be performed consider using a supraglottic airway (LMA / iGel) or basic airway manoeuvres and adjuncts as required 			
4a	Breathing	 Titrate oxygen to maintain saturations of 94-98% Consider eFAST (if available) to augment clinical assessment, but do not delay transfer In hospital: perform chest X-ray (or CT) if available: a normal chest X-ray does not exclude a pneumothorax 			
4b	Pneumothorax	 Decompress chest with a suspected pneumothorax and haemodynamic instability or severe respiratory compromise: for needle decompression use an (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 in ventilated patients (where expertise available), open thoracostomy (4th-5th intercostal space just anterior to the mid-axillary line) is preferred do not perform open thoracostomy in spontaneously ventilating patients Avoid pre-hospital chest drains unless patients are spontaneously ventilating with haemodynamic instability, severe respiratory compromise and no indication for anaesthesia Consider prophylactic antibiotics in patients requiring open thoracostomies, especially if penetrating trauma or transport times exceed 3 hours Cover an open pneumothorax with a simple occlusive dressing or chest seal: if tension pneumothorax occurs remove occlusive dressing or chest seal and decompress as above 			



4c	 Only perform chest drain or thoracostomy if signs of significant respiratory compromise where tension pneumothorax cannot be excluded If thoracostomy reveals a large haemothorax, a chest drain may be helpful to monitor to loss but should not prolong scene time 	
4d	Flail Chest / Multiple rib fractures	 Sit upright if no indication for spinal immobilisation Give appropriate analgesia to allow adequate ventilation Induce anaesthesia if failure to oxygenate / ventilate (if appropriately skilled)
5a	Circulation	Secure IV access, as wide bore as possibleConsider intra-osseous access if IV access cannot be easily achieved
5b	Tranexamic Acid	 Administer a slow bolus dose of 1g tranexamic acid to adults (15mg/kg in children) if suspected active bleeding and no contra-indications Avoid tranexamic acid if time of injury exceeds 3 hours Give a further infusion of 1g tranexamic acid over 8 hours following bolus dose (2mg/kg/hr in children)
5c	Permissive hypotension	 Do not use permissive hypotension in children Permit hypotension in adult patients with haemorrhagic shock: avoid giving fluids if radial pulse present or systolic BP > 90mmHg consider giving fluids if radial pulse is absent or systolic BP < 90mmHg, but withhold if patient is alert with no signs of end-organ failure titrate fluids to a central (femoral or carotid) pulse In adult patients with haemorrhagic shock and traumatic brain injury, if haemorrhagic shock is the dominant condition continue to restrict fluid volume. If traumatic brain injury is thought to be the dominant condition titrate fluids to radial pulse or to maintain cerebral perfusion
5d	Fluid therapy	 Use a fluid warmer if available In haemorrhagic shock, use blood products if available: use crystalloids only if blood products are not available In adults, use 250ml boluses of fluid: reassess pulse / BP / cerebral perfusion after each bolus In children, use fluid boluses of 5-10ml/kg Consider 10% calcium chloride 10mls (0.1ml/kg) if packed red blood cells administered In hospital: in adults use a ratio of 1 unit packed red blood cells to 1 unit of FFP in children (under 16yrs) use a ratio of 1 part packed red blood cells to 1 part FFP based on child's weight after 20ml/kg of packed red blood cells or blood products, give 10ml/kg platelets (if available).



5e	Cardiac Tamponade	 Transport as soon as possible, ideally to MTC Consider rendezvous with pre-hospital trauma team if quicker than direct transfer to MTC. 		
6	Abdomen	Consider FAST ultrasound scan provided it does not delay transport.		
7	Pelvis	 Apply a pelvic binder if: suspecting an open-book pelvic fracture from mechanism of injury there is haemorrhagic shock without other cause Apply directly over skin at level of greater trochanters Do not remove until patient has had appropriate imaging at hospital. Do not "spring" or palpate the pelvis Minimise patient movement In hospital: 		
		- perform pelvic X-ray (or CT) if available		
8a	Limbs	 Reduce and splint displaced fractures to anatomical position: use appropriate analgesia or sedation Examine for and document distal pulses. Use femoral traction splints to reduce femur fractures and maintain alignment: place on the patient after the pelvic binder With an open fracture: give antibiotics, <i>eg</i> ceftriaxone or co-amoxiclav reduce (if possible) to anatomical position cover with saline soaked gauze ensure haemostasis 		
8b	Amputated parts	• Cover in saline soaked gauze in a sealed bag and then place into a container of iced water		
8c	Tourniquets	 Use a tourniquet to control bleeding with life-threatening major haemorrhage if direct pressure fails Place proximally and as close to the wound as possible Can be placed over an area with two bones (forearm and lower limb) as long as haemorrhagic control is adequate Place a second, more proximal tourniquet if haemorrhage control is inadequate Use analgesia or sedation as required to tolerate the tourniquet Record time of applying. 		
9	Other considerations	 Check blood glucose Meticulous packaging and temperature control are therapeutic interventions Optimise analgesia using IV opiate or ketamine 		



10	Triage	Triage appropriately using SAS major trauma and paediatric major trauma triage tools
11	Communication	 Pre-alert receiving centre Consider major haemorrhage or Code Red pre alert with haemorrhagic shock Communicate any safeguarding concerns Ensure all documentation completed



2. Document History				
Reference Number	CG006			
Version	1			
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Date issued 27th July 2018 Format revisions: 23rd April 2019				
Date for review	July 2021			
		EMRS West	\checkmark	
	ScotSTAR	EMRS North	\checkmark	
		Paediatric	\checkmark	
		Neonatal	X	
Distribution	Referring centres via service webs	\checkmark		
	BASICS Scotland		X	
	Medic 1	X		
	Tayside Trauma Team		X	
	Rural GPs Association of Scotland		✓	
	SAS Air Ambulance Division		for information	



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. There is also a variant for the teams working exclusively prehospital (CG006a).

• 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: scotamb.CPG@nhs.net

• Equality Impact Assessment:

Applied to the ScotSTAR Clinical Standards group processes.

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





4. Explanatory Statements

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4.1 Mechanism	Authors' recommendation	Level [Reference]	
 Assess scene for mechanism of injury and energy forces A scene can give information regarding patient injury patterns and energy forces therefore is essential in understanding the patient's injuries and treatment. 	Strong	Guideline [1]	
 Use spinal immobilisation precautions as indicated by mechanism Do not compromise the airway over cervical spine control. 	Strong	Guidelines [1,11,13]	

4.2 Catastrophic haemorrhage		Level [Reference]
If absent carotid pulse use CG002 Traumatic Cardiac Arrest	GPP	
 Control external haemorrhage: apply direct pressure use a haemostatic dressing or modular blast bandages to control external bleeding apply a limb tourniquet where appropriate 	Strong	Guidelines [1,5]

4.3 Airway	Authors' recommendation	Level [Reference]
 induce anaesthesia in patients who cannot maintain their airway or ventilation: anaesthesia should be performed as soon as possible, ideally within 45 minutes of initial 999 call and preferably at the scene induce anaesthesia according to CG007 Emergency Anaesthesia if anaesthesia cannot be performed consider using a supraglottic airway (LMA / iGel) or basic airway manoeuvres and adjuncts as required 	Strong	Guideline [2]

4.4a Breathing	Authors' recommendation	Level [Reference]
• <i>Titrate oxygen to maintain saturations of</i> 94-98% All major trauma patients should be initiated on high flow oxygen, then oxygen should be titrated down to maintain saturations of 94-98%	Strong	Guideline [3]
 Consider eFAST (if available) to augment clinical assessment, but do not delay transfer. A negative eFAST does not exclude a pneumothorax. 	Conditional	Guidelines [2] [3]



•	In hospital:		
	- perform chest x-ray (or CT) if available:	Chaose a	Guideline
	- a normal CXR does not exclude a pneumothorax	Strong	[1]
A	chest X-ray can help identify significant chest injuries.		

4.4b Pneumothorax	Authors' recommendation	Level [Reference]
 Decompress chest with a suspected pneumothorax and haemodynamic instability or severe respiratory compromise: 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. 	Strong	Guidelines [2,3]
 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 	Strong	Guidelines [2,3]
 in ventilated patients (where expertise available), 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 the open thoracostomy site with a commercial chest seal due to the risk of the seal blocking and development of a tension pneumothorax. Ensure when packaging the patient the thoracostomy sites are not covered to prevent blockage. If the patient deteriorates re-finger the tract made in the thoracostomy site. 	Strong	Guidelines [2,3]
 Avoid pre-hospital chest drains unless patients are spontaneously ventilating with haemodynamic instability, severe respiratory compromise and no indication for anaesthesia Insertion of chest drains in the pre-hospital environment can prolong on scene time, kink, block or fall out during transfer and are difficult to perform in a sterile field. However chest drains can be used in spontaneously breathing, haemodynamically unstable patients with respiratory compromise and signs of a large pneumothorax or haemothorax, when general anaesthesia is not indicated. 	Strong	Guidelines [2,3]
• Consider prophylactic antibiotics in patients requiring open thoracostomies, especially if penetrating trauma or transport times exceed 3 hours	Conditional	Guidelines [2,3]



•	Cover an open pneumothorax with a simple occlusive dressing or chest seal:		
	if tension pneumothorax occurs remove occlusive dressing or chest seal and		
	decompress as above	Strong	Guidelines
Thr	ee sided dressings are no longer deemed effective. If the patient becomes	Strong	[2,3]
hae	modynamically unstable or shows signs of respiratory distress, immediately remove		
the	dressing. If this fails to improve patients condition, perform chest decompression.		

4.4c Haemothorax	Authors' recommendation	Level [Reference]
 Only perform chest drain or thoracostomy if signs of significant respiratory compromise and where tension pneumothorax cannot be excluded. Chest drain placement should ideally be delayed until arrival in the ED where blood products and potentially cardiothoracic surgeons are present in case of clot dislodgement and further internal thoracic haemorrhage. 	Strong	Guideline [3]
• If thoracostomy reveals a large haemothorax, use of a chest drain may be helpful to monitor blood loss but should not prolong scene time.	Strong	Guideline [3]

4.4d Flail chest / multiple rib fractures	Authors' recommendation	Level [Reference]
• <i>Sit upright if no indication for spinal immobilisation</i> This will help aid ventilation. There is no evidence that manual splintage is beneficial and it may impair ventilation.	Strong	Guideline [3]
 Give appropriate analgesia to allow adequate ventilation This is the key to managing pain and improving ventilation. Consider iv paracetamol, opioids (fentanyl / morphine) and ketamine. 	Strong	Guideline [3]
 Induce anaesthesia if failure to oxygenate / ventilate (if appropriately skilled) Some patients with flail segments may struggle to oxygenate or ventilate effectively. In this subset intubation and ventilation may be required. 	Strong	Guideline [3]

4.5a Circulation	Authors' recommendation	Level [Reference]
 Secure IV access, as wide bore as possible Consider intra-osseous access if IV access cannot be easily achieved 	Strong	Guideline [1]



4.5b Tranexamic Acid	Authors' recommendation	Level [Reference]
 Administer a slow bolus dose of 1g tranexamic acid to adults (15mg/kg in children) if suspected active bleeding and no contra-indications Avoid tranexamic acid if time of injury exceeds 3 hours Give further infusion of 1g tranexamic acid over 8 hours following bolus dose (or 2mg/kg/hr in children) TXA 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 [6]. The earlier it is given in trauma the more likely it is to have an effect. 	Strong	Guideline [2] 1++ [6]

4.5c Permissive hypotension	Authors' recommendation	Level [Reference]
• <i>Do not use permissive hypotension in children</i> Fluid resuscitation in paediatric trauma is challenging and under-recognition of shock is common. Hypotension is a late sign and early indicators of tachycardia and peripheral vasoconstriction can be mimicked by pain, fear and exposure. Conversely, over- resuscitation is inappropriate in non-bleeding patients. In trauma, early use of blood products, if available, is preferred. There is a lack of evidence supporting permissive hypotension in children and this practice could be dangerous. Children have significant cardiac reserve and are able to compensate for 30-45% of circulating blood volume before this is reflected in a change in blood pressure. Hypotension is often a late and ominous sign. The classic markers of circulatory compromise in a child (tachycardia and peripheral vasoconstriction) can be difficult to elicit in the pre-hospital environment when tachycardia can be a result of pain / anxiety and peripheral vasoconstriction is present in environmental exposure. Permissive hypotension could worsen the neurological insult in traumatic brain injury.	Strong	Guidelines [8] [9] [10]
 Permit hypotension in adult patients with haemorrhagic shock: avoid giving fluids if radial pulse present or systolic BP > 90mmHg consider giving fluids if radial pulse is absent or systolic BP < 90mmHg, but withhold if patient is alert with no signs of end-organ failure titrate fluids to a central (femoral or carotid) pulse Permissive hypotension is thought to reduce further bleeding by preventing dilution of clotting factors and the breakdown of formed blood clots. 	Strong	Guidelines [2] [6] [7]



•	In adult patients with haemorrhagic shock and traumatic brain injury, if haemorrhagic shock is the dominant condition continue to restrict fluid volume. If traumatic brain injury is thought to be the dominant condition titrate fluids to radial pulse or to		
	maintain cerebral perfusion	Strong	Guideline [2]
In	head injury patients it is important to maintain an adequate cerebral perfusion		
pr	essure to prevent secondary brain injury therefore a decision regarding the most		
dc	minant condition is helpful in determining therapeutic interventions.		

4.5d Fluid therapy	Authors' recommendation	Level [Reference]
 Use a fluid warmer if available Hypothermia worsens coagulopathy and acidosis; give warm fluids if possible. 	Strong	Guideline [1]
 In haemorrhagic shock, use blood products if available: use crystalloids only if blood components are not available Crystalloids may dilute clotting factors and potentially disrupt formed blood clots therefore using blood products is thought to be more beneficial. 	Strong	Guidelines [2,7,10]
 In adults, use 250ml boluses of fluid: reassess pulse / BP / cerebral perfusion after each 	Strong	Guideline [13]
 In children, use fluid boluses of 5-10ml/kg PHPLS guidelines suggest 5 ml/kg; APLS10 ml/kg of saline. This writing group consensus is that either amount is appropriate. 	Strong	Guideline [8]
Consider 10% calcium chloride 10mls (0.1ml/kg) if packed red blood cells administered	Conditional	Guideline [10]
 In hospital: in adults use a ratio of 1 unit packed red blood cells to 1 unit of FFP in children (under 16yrs) use a ratio of 1 part packed red blood cells to 1 part FFP based on child's weight after 20ml/kg of packed red blood cells or blood products, give 10ml/kg platelets (if available). 	Strong	Guidelines [2,7,8,10]

4.5e Cardiac tamponade	Authors' recommendation	Level [Reference]
• <i>Transport as soon as possible, ideally to MTC</i> Minimise on scene time. No evidence for pre-hospital pericardiocentesis.	Strong	Guidelines [3]
• Consider rendezvous with pre-hospital trauma team if quicker than direct transfer to MTC.	GPP	



4.6 Abdomen	Authors' recommendation	Level [Reference]
 Consider FAST ultrasound scan provided it does not delay transport. FAST can help rule in intra-abdominal bleeding if positive (>500mls fluid in abdomen). However it cannot rule out intra-abdominal bleeding. It should not delay on scene time. 	Conditional	Guideline [2]

4.7 Pelvis	Authors' recommendation	Level [Reference]
 Apply a pelvic binder if: suspecting an open-book pelvic fracture from mechanism of injury there is haemorrhagic shock without other cause 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. 	Strong	Guidelines [1,4]
• Apply directly over skin at level of greater trochanters The pelvic binder should not be placed on top of clothing as this will reduce its effectiveness and increase the risk of pressure sores and discomfort	Strong	Guidelines [1,4]
• Do not remove until patient has had appropriate imaging at hospital. Removing the pelvic binder could disrupt formed blood clots, leading to further blood loss and haemodynamic instability	Strong	Guidelines [1,4]
 Do not "spring" or palpate the pelvis Minimise patient movement Patient movement or "springing" the pelvis has the potential to disrupt formed blood clots and lead to further blood loss. 	Strong	Guidelines [1,4]
 In hospital: perform pelvic X-ray (or CT) if available To identify/exclude pelvic injury 	Strong	Guidelines [1,4]

4.8a Limbs	Authors' recommendation	Level [Reference]
 Reduce and splint displaced fractures to anatomical position: use appropriate analgesia or sedation This may require iv opiate analgesia or iv ketamine analgesia / sedation if skills allow. 	Strong	Guideline [1]
• Examine for and document distal pulses. To determine neurovascular supply to limbs.	Strong	Guidelines [1] [13]



 Use femoral traction splints to reduce femur fractures and maintain alignment: place on the patient after the pelvic binder This may not be possible e.g. significantly displaced tib / fib fractures, partial / full amputations etc. Consider using a box splint in these situations. 	Strong	Guidelines [1] [13]
 With an open fracture: give antibiotics, eg ceftriaxone reduce (if possible) to anatomical position cover with saline soaked gauze ensure haemostasis Open fractures have a high incidence of wound infection therefore use of saline soaked gauze and strong antibiotic prophylaxis is recommended. 	Strong	Guidelines [1] [13]

4.8b Amputated parts	Authors' recommendation	Level [Reference]
 Cover in saline soaked gauze in a sealed bag and then place into a container of iced water This can help an help preserve the amputated part. There are some situations in which amputated parts can be re-attached so amputated parts should be transported. 	Strong	Guideline [1]

4.8c Torniquets		Authors' recommendation	Level [Reference]
•	Use a tourniquet to control bleeding with life-threatening major haemorrhage if direct pressure fails	Strong	Guideline [5]
•	Place proximally and as close to the wound as possible		
•	Can be placed over an area with two bones (forearm and lower limb) as long as haemorrhagic control is adequate		
•	Place a second, more proximal tourniquet if haemorrhage control is inadequate		
Α	tourniquet is considered to be adequate if there is no pulse present distal to the		
toı	urniquet.		
•	Use analgesia or sedation as required to tolerate the tourniquet		
•	Record time of applying.		



4.9 Other considerations	Authors' recommendation	Level [Reference]
Check blood glucose	Strong	Guideline [1]
• <i>Meticulous packaging and temperature control are therapeutic interventions</i> Movement of patients increases pain and can disrupt clots and increase internal haemorrhage. Hypothermia worsens metabolic acidosis and patient outcome. Minimise heat loss using warm blankets, bubble-wrap, foil blankets and vacuum mattress as available.	Strong	Guideline [1,4,11]
• Optimise analgesia using IV opiate or ketamine Titrated IV opioid should be first line treatment for analgesia, consider analgesic doses of ketamine as second line (especially if haemodynamic instability, or requirement for additional sedation).	Strong	Guideline [2]

4.10 Triage	Authors' recommendation	Level [Reference]
• Triage appropriately using SAS major trauma and paediatric major trauma triage tools		
Patients for trauma unit care (on mechanism or special considerations) should be taken to a trauma unit (or MTC if nearer) if within 45 minutes travel time. If greater than 45 minute transfer, contact 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	GPP	

4.11 Communication	Authors' recommendation	Level [Reference]
Pre-alert receiving centre	Strong	Guideline
		[1]
Consider major haemorrhage or Code Red pre alert with haemorrhagic shock	GPP	
Communicate any safeguarding concerns		
If there are safeguarding concerns regarding children or vulnerable adults this should	GPP	
be reported as per the safeguarding guideline and should be discuss with the senior		
receiving clinician.		
Ensure all documentation completed		
Records should be accurate and up to date; information gathered at scene is extremely	GPP	
helpful to all those involved subsequent patient care.		



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