

Traumatic Cardiac Arrest

Position Responsible: Clinical Governance Committee
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Related Documents	SOP 4.6 Emergencies in Pregnancy SOP 2.21 Resuscitative Thoracotomy
Further Information	Resuscitation Council (UK) Pre-hospital Resuscitation Guideline European Resuscitation Council Guideline TEMPO manual section 06.a
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1.0 Background

- 1.1 Historically, reported survival from traumatic cardiac arrest (TCA) was extremely low. More recent publications have recorded survival to discharge of up to 8%. Providers of pre-hospital care must understand that resuscitation from traumatic cardiac arrest is not always futile and survival from has improved considerably over the past decade. The main aim of pre-hospital management of traumatic cardiac arrest is to rapidly identify and treat reversible causes.
- 1.2 This SOP describes the actions to be taken in the event of a traumatic cardiac arrest. It should be read in conjunction with the Magpas Resuscitation Policy, the Emergencies in Pregnancy SOP and the resuscitative thoracotomy SOP.

2.0 Objectives

- 2.1 To standardise the optimal approach to the management of pre-hospital traumatic cardiac arrest by pre-hospital emergency medical services.

3.0 Diagnosis

- 3.1 Traumatic cardiac arrest is a clinical diagnosis. Assess for agonal, abnormal or absent breathing, and the absence of a central pulse to confirm cardiac arrest. This should be a rapid check and should take less than 10 seconds.
- 3.2 Resuscitation should not be started when there is unequivocal evidence of death. Further guidance on not starting resuscitation and advance directives are given in the Magpas Resuscitation Policy.

4.0 Process

4.1 Overview

- 4.1.1 TCA should be aggressively managed using a standardised approach that rapidly addresses the reversible causes in order of priority.

4.2 Team roles

- 4.2.1 Team Leadership – It is most likely that one of the Magpas clinical team will be required to perform the team leader role. Given that it is also likely that the Magpas clinical team will be

required in an interventional role, team leadership should occur from within the cardiac arrest team rather than stood in a traditional 'end of the bed' position.

4.2.2 Team roles should be allocated based on the resources and skill set of those available. It is likely that clinical resources will be limited and considerations should be given the appropriate utilisation of non-clinical responders (air crew, Police, Fire etc).

4.2.3 If resources allow the optimal team role allocation would be:

- Airway provider – Likely a Magpas clinician but as a minimum should be a Paramedic.
- Airway assistant – Technician or Paramedic.
- Thoracostomies – Magpas clinician(s).
- Vascular access – Magpas clinician or Paramedic.
- Give 20ml/kg fluid – any responder
- Remove clothing – Any responder.
- External haemorrhage control – any responder.
- Pelvic binder/long bone splinting – Magpas clinician, Paramedic or Technician.
- Chest compressions – Any responder.

4.2.4 The above roles would be allocated based on treatment priorities and available resources. Multiple roles may be held by an individual. Where possible team allocation should allow management priorities to be performed concurrently.

4.3 Positioning

4.3.1 Where possible 360 degree access to the patient should be achieved. This may require rapid rescue or movement of the patient. This should be undertaken by the quickest means possible. Consideration should be given to the safety of the rescuers and manual handling technique. Where possible in blunt mechanism there should be some consideration given to protecting the spine during movement however, priority should be given to potentially reversible aetiologies of TCA, while maintaining careful handling and spine protection as able.

4.4 Management STEP 1

4.4.1 The primary objective is to concurrently manage hypoxia, tension pneumothorax and hypovolaemia:

- Oxygenate – endotracheal intubation and ventilation with 100% oxygen
- Decompress – bilateral open thoracostomies.
- Fill – wide-bore vascular access and high volume intravascular filling (≥ 20 ml/kg of crystalloid/blood products).

4.4.2 In those anticipated to be unresponsive to laryngoscopy, then 'crash' intubation is recommended (see PHEA SOP). In patients not sufficiently relaxed, for example with trismus, then drug-assisted intubation can be undertaken (Rocuronium only). If a supraglottic device is already in situ, its function must be assessed and consideration given to whether immediate intubation is necessary or whether other interventions may be completed first. Ensure capnography is in place and confirms presence of a patent effective airway.

4.4.3 In patients who are trapped or have extensive facial disruption consideration should be given to managing the airway with the use of an immediate supraglottic device ("Plan B") or a primary surgical airway (elective Plan D). Needle thoracocentesis may be performed initially

for reasons of access or expediency but these should not be considered to provide definitive thoracic decompression.

4.4.4 Preferably two points of wide-bore intravascular access should be obtained. This could include intravenous or intraosseous routes. Consideration should be given to the achievable flow rate of the IO route if large volume fluid resuscitation is required.

4.4.5 Where possible and if flow rates are not compromised fluids should be warmed. During resuscitative thoracotomy filling would normally be withheld until cardiac repair or haemorrhage control is achieved.

4.5 Management STEP 2

4.5.1 Once primary objectives have been commenced, control ongoing haemorrhage:

- Check/apply combat application tourniquets.
- Check/apply pelvic binder.
- Straighten long bone deformities.
- Apply pressure dressings/haemostatic dressings.
- Address maxfax bleeding.
- Administer Tranexamic Acid 1g or 15mg/kg.

4.5.2 Catastrophic external haemorrhage should be managed assertively and there should be a low threshold for the use of tourniquets and haemostatic dressings. This management can be reviewed at a later stage if ROSC is achieved.

4.5.3 In all blunt TCA the pelvis should be splinted using an appropriate circumferential binder.

4.5.4 All long bone fractures should be reduced and returned to normal anatomical alignment in order to reduce ongoing haemorrhage. If resources allow manual traction should be continued during resuscitation.

4.6 Management STEP 3

4.6.1 Once the secondary objectives have been commenced, consider further intervention:

- Resuscitative thoracotomy.
- Resuscitative hysterotomy.
- Chest compressions.

4.6.2 Resuscitative thoracotomy should be performed within 15 minutes of loss of cardiac output in penetrating trauma and 5 minutes in blunt trauma. A rapid decision should be taken as to when these should be performed in relation to STEP's 1 and 2. Where possible actions should be undertaken concurrently. Further guidance can be found in SOP 2.21.

Resuscitative thoracotomy in blunt trauma will primarily be for control of sub-diaphragmatic haemorrhage. This procedure is less supported by the evidence base and requires additional surgical techniques. The decision to perform this intervention should consider futility and the availability of the necessary skills.

4.6.3 Patients in the second half of pregnancy (uterine fundus above the umbilicus) should be resuscitated in the left lateral tilt position at least 15 degrees to minimise uterocaval compression. This may be achieved by tilting and propping a scoop stretcher or extrication board but should not be undertaken if the patient is lying on a soft surface.

Survival of both mother and baby may be dependent on undertaking a resuscitative hysterotomy. It may be necessary to undertake this in the pre-hospital environment. The decision to undertake resuscitative hysterotomy should occur within 15 minutes of loss of cardiac output. Consider that newborn resuscitation may be appropriate if the delivered baby shows signs of life following this procedure, and this will impact on resource utilisation and CRM. For further information, see SOP 4.6 Emergencies in Pregnancy.

4.6.4 Cardiac monitoring should be applied as early as possible. If a shockable rhythm is identified, defibrillate immediately

4.6.5 Chest compressions should be commenced only once reversible causes are being addressed. Chest compressions should not interfere with or obstruct TCA management.

4.7 Underlying Medical Causes

4.7.1 Patients without obvious injury or those involved in apparent low energy mechanisms should be suspected of having a primary medical event prior to traumatic injury. In these situations it would be appropriate to start CPR and attach cardiac monitoring whilst the facts are established. Traumatic injury should still be considered as a reversible cause.

5.0 Return of spontaneous circulation

5.1 ROSC following a traumatic cardiac arrest represents a patient in a fragile state and with likely a variety of ongoing needs. The following ROSC care bundle should be delivered:

- Re-assess <C>ABCDE.
- Ensure catastrophic haemorrhage is controlled.
- Ensure the airway is secured with an endotracheal tube. If this was not done intra-arrest this may now require a pre-hospital emergency anaesthetic.
- Ensure adequate and optimal positive pressure ventilation. The patient should be established on a mechanical ventilator with an appropriate ventilation strategy. (Set PEEP to 0mmHg if suspected haemorrhagic aetiology of cardiac arrest)
- Ensure thoracostomy incisions remain patent. Consider insertion of chest drains if excessive blood loss or if there is difficulty maintaining the patency of the tract.
- Ensure there is control of external haemorrhage.
- Formally splint long bone fractures.
- Splint pelvis as part of packaging if not already done.
- Ensure patency of vascular access.
- Stop fluid resuscitation and give fluid boluses to a central pulse. In the very unstable patient vaso-active drugs may be required. In patients with suspected brain injury consideration should be given a balanced resuscitation strategy that preserves a higher MAP in order to maintain adequate cerebral perfusion.
- Package skin to scoop with blizzard blanket and additional blankets as required.
- Establish multi-modality monitoring.
- Measure temperature and adjust packaging as required.
- Ensure adequate sedation and paralysis as required.

5.2 The patient should be transferred to the most appropriate hospital. This decision should be based on the condition of the patient and the trauma triage tool. In most circumstances it would be most appropriate to go to the nearest Trauma Hospital for immediate blood and imaging.

- 5.3 A pre-alert should be given via NCS, utilising a standard ATMISTER structure. Particular attention should be paid to special requests such as activation of the massive blood loss protocol and the likely need for an immediate transfer to theatre.

6.0 Terminating Resuscitation

- 6.1 The decision to terminate resuscitation in a patient in traumatic cardiac arrest needs to consider a number of factors; period since loss of cardiac output, presenting rhythm, reversal of underlying causes.
- 6.2 In paediatric patient's consideration should be given to continuing resuscitation and rapid transport to hospital within the management plan. This should take into consideration likely transfer time and the available resources. If resuscitation is terminated on a paediatric patient the deceased should be transported to the nearest ED and not left on scene.
- 6.3 This is a team decision. Ensure all personnel involved on scene are involved in this decision-making. A scene debrief can be used to explain any rationale around termination of resuscitation.
- 6.4 Clear documentation must be completed to support the interventions and decision-making. Ambulance staff who have made initial assessments and interventions prior to the arrival of the team are required to, and may need to be directed to complete their own PCR. Always ensure that even when resuscitation is ceased that the Trauma Triage Tool is completed as MTve+.
- 6.5 In cases of an unsuccessful TCA resuscitation attempt the team are required to communicate directly with the police on scene prior to departure. By the nature of TCA, many of these are treated as criminal investigations and consideration should be given to this with regard forensic preservation of the scene and writing of contemporaneous notes to be used to inform future police or coroner statements.
- 6.6 Consider the impact of the management of such cases on those involved and the need for debriefing prior to making yourself available for further taskings.

7.0 Audit Standards

- 7.1 The following will form a simple bundle of audit standards for the management of traumatic cardiac arrest:
- Endotracheal tube placed with capnography
 - Ventilation with 100% oxygen
 - Bilateral thoracostomies
 - 20ml/kg fluid bolus unless ROSC achieved
 - Pelvic binder applied in blunt TCA
 - Resuscitative thoracotomy <15 mins from loss of output in penetrating thoracic trauma

Appendix 1 – Traumatic Cardiac Arrest Algorithm

