

PAEDIATRIC TRAUMATIC CARDIAC ARREST

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- A child with a Traumatic Cardiac Arrest requires systematic assessment and interventions, with early senior staff present to guide resuscitation.
- A Trauma Attend should be activated and the Surgical Registrar should ensure that the on call Surgical or Trauma Consultant is aware of the case.
- The patient should be managed in the Resuscitation Area and the team should consider the early activation of the Massive Transfusion Protocol or Code Crimson.
- The team should focus on the treating the potentially reversible factors of: Hypoxia, Hypovolemic, Tension pneumothorax and Cardiac tamponade.

CHANGE SUMMARY

- N/A - New policy

READ ACKNOWLEDGEMENT

- All clinical staff (medical and nursing) and Surgical medical officers working in the Emergency Department are to read and acknowledge they understand the contents of this document.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st September 2019	Review Period: 3 years
Team Leader:	Consultant	Area/Dept: Emergency Department

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Management Summary

Paediatric traumatic cardiac arrest (TCA) has a high mortality and is a rare event in Australia. However, if the reversible causes of hypoxia, hypovolaemia, tension pneumothorax / massive haemothorax and cardiac tamponade can be treated effectively then return of spontaneous Circulation (ROSC) can be achieved hopefully with a good neurological outcome.

The response to TCA is time critical and senior staff must be informed of the patient's condition immediately, particularly the surgical / trauma consultant on call

It is vital that a medical cardiac arrest is not misdiagnosed as a TCA. Cardiac arrest or other causes of sudden loss of consciousness (e.g. hypoglycaemia, stroke, and seizures) may cause a secondary traumatic event.

This algorithm applies to a general TCA, but does not apply to isolated hypoxic events such as drowning, asphyxiation and impact apnoea where there is no disturbance of circulating volume and the focus of assessment and management should be on the patient's airway and breathing. This guideline is also not applicable to patients with isolated severe head injury.

The principles of this guideline are taken from the *European Resuscitation Council Guidelines for Resuscitation 2015 Section 4. Cardiac arrest in special circumstances* document (<http://dx.doi.org/10.1016/j.resuscitation.2015.07.017>) and the recent *Paediatric traumatic cardiac arrest: the development of an algorithm to guide recognition, management and decisions to terminate resuscitation* from the Paediatric Emergency Research in the UK and Ireland (PERUKI) group (<http://dx.doi.org/10.1136/emered-2018-207739>)

Although the management of the reversible causes of TCA should take priority, patients should also have standard Advanced Life Support, including cardiac compressions, adrenaline and defibrillation where indicated.

Guideline

1.1 Recognition of Traumatic Cardiac Arrest

- No signs of life
- No palpable pulse

1.2 Call for help

- Trauma Attend
- Ensure Emergency Consultant /fellow aware
- Ensure Surgical / Trauma Consultant aware

1.3 Exclude medical cardiac arrest

- Medical causes of cardiac arrest can lead to traumatic cardiac arrest
- Ensure standard Advanced Life Support initiated, including rhythm recognition

1.4 Simultaneously address reversible causes

Hypoxia

Tension pneumothorax / Massive haemothorax

Hypovolaemia

Cardiac tamponade

- Control external catastrophic haemorrhage
 - Direct pressure
 - Limb tourniquets
- Control airway and ventilation
 - Intubation, or use LMA if not competent to intubate
- Decompress the chest – bilateral thoracostomies
 - Initial finger thoracostomies will need to be converted to formal intercostal catheters with ROSC
 - In a spontaneously breathing patient, finger thoracostomies can act like a sucking chest wound and further worsen respiratory function

- IV or IO access
 - With abdominal or lower limb injuries strongly consider arm IV access or proximal humeral IO access

- Rapid volume replacement
 - Warm blood and blood products
 - At CHW, 2 units of O Neg packed cells are immediately available in the Blood Esky
 - If blood isn't immediately available then use 0.9% Sodium Chloride
 - Activate the Massive Transfusion Protocol

- Apply pelvic binder in blunt trauma

- Consider activation of Code Crimson for immediate transfer to the operating theatre for definitive haemorrhage control

- Consider immediate resuscitative thoracotomy, either in ED or OT as part of Code Crimson
 - Especially in penetrating trauma to treat pericardial tamponade
 - Considerations for resuscitative thoracotomy
 - Elapsed time < 10 minutes since arrest
 - Is the **Expertise** available?
 - Is the **Equipment** available?
 - Which is the appropriate **Environment** to undertake the procedure?

- Use point of care ultrasound E-FAST
 - Sonographers need to have formal training and be accredited or at least be enrolled in a formal ultrasound training program
 - Scans must be recorded for real time review and retrospective audit
 - The sonographer performing the scans should write their report in the patient medical record
 - Useful indications:
 - Pericardial / pleural fluid collections
 - Pneumothorax
 - Assessment of cardiac activity and filling
 - Free fluid in the abdomen

- Sonographers should ensure they are familiar with the controversies of interpreting ultrasound images in the arrested patient including:
 - Cardiac standstill
 - Cardiac tamponade

1.5 Definitive and supportive care

- With ROSC the patient should have definitive care which may be transfer to theatre, CT Scan or PICU
- Ensure haemodynamic parameters are agreed and adhered to e.g. in head or spinal injury blood pressure will need to be maintained according to the head injury guidelines
- Patients may require inotrope or vasopressor support

1.6 Decision to stop resuscitation

- It is beyond the scope of this guideline to describe when it is appropriate to stop resuscitation
- Senior decision makers should be present from the start of the resuscitation and agree on terminating resuscitative efforts
- Considerations:
 - Duration of cardiac arrest
 - Lack of response to life saving interventions
 - Persistent low end tidal CO₂
 - Cardiac standstill on ultrasound

References

1. European Resuscitation Council Guidelines for Resuscitation 2015: Section 4. Cardiac arrest in special circumstances. Truhlář A, Deakin CD, Soar J, Khalifa GE, Alfonzo A, Bierens JJ, Brattebø G, Brugger H, Dunning J, Hunyadi-Antičević S, Koster RW, Lockey DJ, Lott C, Paal P, Perkins GD, Sandroni C, Thies KC, Zideman DA, Nolan JP; Cardiac arrest in special circumstances section Collaborators. Resuscitation. 2015 Oct; 95:148-201. doi: 10.1016/j.resuscitation.2015.07.017. Epub 2015 Oct 15. <https://www.sciencedirect.com/science/article/pii/S0300957215003299?via%3Dihub>
2. Paediatric traumatic cardiac arrest: the development of an algorithm to guide recognition, management and decisions to terminate resuscitation. Vassallo J, Nutbeam T, Rickard AC, Lyttle MD, Scholefield B, Maconochie IK, Smith JE; PERUKI (Paediatric Emergency Research in the UK and Ireland). Emerg Med J. 2018 Nov;35(11):669-674. doi: 10.1136/emmermed-2018-207739. Epub 2018 Aug 28. <https://emj.bmj.com/content/35/11/669>

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Paediatric Traumatic Cardiac Arrest Algorithm

