N04: Traumatic Cardiac Arrest

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Introduction

A traumatic cardiac arrest is a cardiac arrest that occurs secondary to either blunt or penetrating trauma. The most common cause of traumatic cardiac arrest is hemorrhage. Other causes include tension pneumothorax, cardiac tamponade, and hypoxemia. Although traumatic cardiac arrest has a high mortality rate, the neurological outcomes are better in those who survive compared to other causes of cardiac arrest. Patients who have some signs of life upon the arrival of paramedics, or who initially present in pulseless electrical activity, and who subsequently achieve a return of spontaneous circulation, have the greatest probability of survival to hospital discharge.

Successful resuscitation requires simultaneous attention to assessment, airway management, and hemorrhage control.

Essentials

- Consider underlying medical causes of the cardiac arrest.
- Prioritize treatment of reversible causes over chest compressions in order of clinical precedence.
- Simultaneously attempt to identify and treat:
  - Hypovolemia
  - Hypoxemia
  - Tension pneumothorax
- Consider special circumstances.
- Consult with CliniCall to discuss treatment plan or early transport options.
- Consider discontinuing resuscitation efforts if interventions do not result in a return of spontaneous circulation.

Additional Treatment Information

- Interventions in traumatic cardiac arrests should be prioritized based on clinical relevance. Paramedics should focus initially on controlling major hemorrhage through the appropriate use of direct pressure, tourniquets, and wound packing.
- Advanced airway management should not delay transport in urban areas where the traumatic arrest is the result of penetrating thoracic trauma, the presenting rhythm is PEA, and the time from loss of pulses to a trauma center is less than 15 minutes (20 minutes in the Vancouver Coastal-Urban region).
- Bilateral needle thoracentesis (or finger thoracostomy) should be performed on all traumatic arrests with blunt or penetrating chest trauma. The preferred site for needle thoracentesis is the 5th intercostal space in the mid-axillary line. An alternative site is the 2nd intercostal space on the mid-clavicular line, although this requires catheters longer than 5 cm. Prehospital needle thoracentesis should be considered AGMP. Although this is a low occurrence procedure, it does potentially expose the practitioner to an increased risk of exposure. If this procedure is needed, crews are directed to proceed with airborne PPE including face-shield, EHFR/N95 mask, gown, and gloves.
- Obtain large-bore intravenous (or intraosseous) access and administer a bolus of 20 mL/kg.
- In blunt force cardiac arrest, a pelvic binder may be applied after addressing other reversible causes. If a pelvic fracture is suspected of being a significant contributing factor, the binder should be placed earlier.

General Information

- The primary etiologies targeted by prehospital treatments include hypoxia, obstructive shock (specifically tension pneumothorax) and hypovolemia.
- Patients frequently present in an organized electrical rhythm on the monitor with no palpable pulses. It has been shown that in these situations there is often a low perfusion state due to hypovolemia or vascular and cardiac

obstruction preventing adequate perfusion. For management of major hemorrhage, volume replacement with large NS bolus or bilateral chest decompression may result in ROSC.

- Traumatic cardiac arrests with an initial rhythm of asystole, or wide complex PEA of less than 40 beats per minute are generally associated with poor outcomes. It is reasonable to consider early discontinuation of resuscitation if there is no response to treatment.

Interventions

First Responder

- Simultaneous on-scene correction of reversible causes:
  - Hypovolemia: control external hemorrhage, splint pelvis/fractures.
  - Oxygenation: consider appropriate airway adjunct. Maximize oxygenation.
    - → A07: Oxygen and Drug Administration
- High quality CPR when practical:
  - → PR06: High Performance CPR
  - Paramedics are required to wear airborne PPE (N95/EHFR, face shield, gown, gloves) before initiating CPR and resuscitation. A surgical mask should be placed over the patient's face before initiating CPR. Defibrillation, when indicated, should be administered as early as possible. Airway management by EMR and FR licensed responders who cannot insert an iGel should provide a tight seal with the BVM using a 2 person technique where possible. Chest compressions should pause for ventilations using a 30:2 ratio. An inline viral filter should be used between the mask and the bag-valve device.
  - Rate (100-120/min) continuous compressions.
  - Depth: At least 2 inches [5cm].
  - Ensure full chest recoil.
  - Minimize interruptions of compressions.
  - Relieve compressor every 2 minutes, or sooner if fatigued.

Emergency Medical Responder – All FR interventions, plus:

- Consider primary medical cause – see CPG N02: Adult Cardiac Arrest
- Prioritize treatment of reversible causes over chest compressions based on clinical precedence.
- Consider recognition of life extinct – see CPG R03

Primary Care Paramedic – All FR and EMR interventions, plus:

- Simultaneous on-scene correction of reversible causes:
  - Hypovolemia
    - Establish vascular access, consider 20 mL/kg fluid bolus.
  - Oxygenation:
    - Consider supraglottic device.
    - If required, the airway should be managed using an iGel with a viral filter pre-connected before insertion or 2 person bag-valve-mask ventilation using a viral filter and a tight mask seal.

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Simultaneous on-scene correction of reversible causes:
  - Oxygenation
    - Consider supraglottic device, endotracheal intubation, or surgical airway.
    - In cases of cardiac arrest where effective ventilation and oxygenation cannot be achieved with an iGel, and where 2 person bag-valve-mask technique may not be suitable, tracheal intubation can be considered using video laryngoscopy (VL), when it is safe to do so.
  - Tension pneumothorax
    - Bilateral needle or finger thoracostomy
    - Prehospital needle thoracentesis should be considered AGMP. Although this is a low occurrence procedure, it does potentially expose the practitioner to an increased risk of exposure. If this procedure is needed, crews are directed to

proceed with airborne PPE including face-shield, EHFR/N95 mask, gown and gloves.

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Simultaneous on-scene correction of reversible causes:
  - Hypovolemia
    - Consider blood product resuscitation.
    - Consider resuscitative balloon for occlusion of the aorta.
  - Tension pneumothorax
    - Bilateral needle, finger, or tube thoracostomy.
    - Prehospital needle thoracentesis should be considered AGMP. Although this is a low occurrence procedure, it does potentially expose the practitioner to an increased risk of exposure. If this procedure is needed, crews are directed to proceed with airborne PPE including face-shield, EHFR/N95 mask, gown and gloves.
  - Pericardial tamponade
    - Pericardiocentesis.

Evidence Based Practice

Traumatic Arrest

References

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Practice Updates

1. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]
2. American College of Surgeons. Advanced Trauma Life Support Student Course Manual. 10th Edition. 2018. [Link]
3. Sinz E, et al. ACLS for Experienced Providers: Manual and Resource Text. 2015.