

## N04: Traumatic Cardiac Arrest

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Updated: June 19, 2024

Reviewed: December 19, 2023

### 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 EMRs/FRs, 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.
- Consider discontinuing resuscitation efforts if interventions do not result in a return of spontaneous circulation.
- [On-Call consultation required](#) to discuss treatment plan or early conveyance options.

### Additional Treatment Information

- Interventions in traumatic cardiac arrests should be prioritized based on clinical relevance. Paramedics and EMRs/FRs should focus initially on controlling major hemorrhage through the appropriate use of direct pressure, tourniquets, and wound packing.
- Advanced airway management should not delay conveyance in urban areas where the traumatic arrest is the result of penetrating chest trauma, the presenting rhythm is PEA, and the time from loss of pulses to a trauma centre is less than 15 minutes (20 minutes in the Vancouver Coastal-Urban region).
- Bilateral needle thoracentesis should be performed on all traumatic arrests with blunt or penetrating chest trauma. The preferred site for needle thoracentesis is the 5<sup>th</sup> intercostal space in the mid-axillary line. An alternative site is the 2<sup>nd</sup> intercostal space on the mid-clavicular line, although this requires catheters longer than 5 cm.
- 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.

### Referral Information

- Triage according to the [Pre-hospital Triage and Transport Guidelines for Adult and Pediatric Major Trauma](#) decision tool, including Physiological Criteria, Anatomical Criteria, Mechanism of Injury Criteria, and Special Considerations.

### General Information

- The primary etiologies targeted by out-of-hospital 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

- 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.
- Simultaneous on-scene correction of reversible causes:
  - Hypovolemia: control external hemorrhage, splint pelvis/fractures
  - Oxygenation: consider appropriate airway adjunct; maximize oxygenation
    - → [A07: Oxygen Administration](#)
- High quality CPR when practical:
  - Rate (100-120/min) continuous compressions
  - Depth: At least 5 cm (2 inches)
  - 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 [N02: Adult Cardiac Arrest](#)
- Prioritize treatment of reversible causes over chest compressions based on clinical need:
  - Tension pneumothorax (see [H06: Chest Trauma](#))
  - Hypovolemia (see [D01: Shock](#) and [D02: Bleeding](#))
  - Cardiac tamponade
- Consider recognition of life extinct – see [R03: Recognition of Life Extinct](#)
- Discontinue in cases of obvious death:
  - Transsection
  - Decapitation
  - Incineration
  - Cranial and cerebral destruction

For blunt traumatic cardiac arrest:

- Carefully review the history of the event. It can be difficult to determine if a medical event preceded the traumatic injury, or if severe trauma resulted in the cardiac arrest. Resuscitation is unlikely in patients with signs of major trauma, and the absence or loss of pulses and respiration (whether after the initial assessment and rapid trauma survey, or during conveyance). [Contact OniCall to discuss discontinuation instructions.](#)
- Consider the possibility of an underlying medical cause in traumatic arrests that present with injuries consistent with lower levels of blunt force.

For penetrating traumatic cardiac arrest:

- This is a unique scenario where rapid surgical intervention may allow for control of a bleeding site and subsequent resuscitation. Time is critical: transport to a Lead Trauma Hospital *or* the closest emergency department if time of loss of pulse/respiration is **less than 15 minutes**. In cases where transport time is greater than 15 minutes, [consult with OniCall for discontinuation instructions.](#)

If ClinicaCall is unreachable, and transport times exceed 15 minutes, discontinuation of resuscitation is appropriate regardless of whether the traumatic injuries are blunt or penetrating.

#### 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
      - → [D03: Vascular Access](#)
  - Oxygenation:
    - Consider supraglottic device
      - → [PR08: Supraglottic Airway](#)
    - 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, PCP, and ACP interventions, plus:

- Simultaneous on-scene correction of reversible causes:
  - Oxygenation
    - Consider supraglottic device, endotracheal intubation, or surgical airway
  - Tension pneumothorax
    - [Bilateral needle thoracentesis](#)

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

- Simultaneous on-scene correction of reversible causes:
  - Hypovolemia
    - Consider [blood product resuscitation](#)
  - Tension pneumothorax
    - [Bilateral needle thoracostomy](#)
  - Pericardial tamponade
    - Pericardiocentesis

## Evidence Based Practice

Traumatic Arrest

### Supportive

- [BVM](#)
- [Hemorrhage control](#)
- [HEMS](#)
- [Needle Decompression](#)
- [Thoracostomy](#)
- [Thoracotomy](#)

### Neutral

- [Advanced airway](#)
- [Termination of Resuscitation \(Blunt\)](#)
- [Termination of Resuscitation \(Penetrating\)](#)

### Against

- [Epinephrine](#)

- [Spinal immobilization](#)

## References

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.

## Practice Updates

- 2021-10-20: Added discontinuation and conveyance criteria to EMR interventions.
- 2023-12-19: removed COVID-related restrictions

