

Clinical Practice Guideline 11:

Traumatic Cardiac Arrest

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KEY MESSAGES

- Consider a medical cause of cardiac arrest.
- Survival is extremely unlikely after 15 minutes without circulation or in asystole.
- Immediate intervention must address the reversible pathologies of hypovolaemia, oxygenation and tension pneumothorax.
- Immediate Resuscitative Thoracotomy is indicated in penetrating chest trauma or where there is ultrasound evidence of cardiac tamponade (where a clinician with this skillset is immediately available).
- Chest compressions may provide some blood flow but should not be prioritised above the reversible causes of traumatic cardiac arrest.

NIMTN Clinical Practice Guidelines are intended to inform standardised, best-practice care for injured patients across Northern Ireland. Although they are based on up to date evidence at the time of writing, readers should note that it remains the responsibility of individual clinicians to make final decisions regarding the most appropriate treatment for specific patients in their care.

Prehospital practitioners employed by Northern Ireland Ambulance Service (including those involved in specialist teams such as HEMS and HART) may find these guidelines informative but should continue to follow guidance contained within JRCALC, NIAS and HEMS guidelines and SOPs.

Background

The management of cardiac arrest in the context of trauma differs significantly to the management of a “medical” cardiac arrest. The objective of this Clinical Practice Guideline is to provide a standardised, structured approach to the treatment of traumatic cardiac arrest across the NI Major Trauma Network.

It should be noted that transport from the pre-hospital setting to hospital, or from the ED resuscitation room to theatre, with a patient in traumatic cardiac arrest is usually futile. Key interventions need to be performed rapidly on scene to provide any chance of survival.

Survival is extremely unlikely in asystole or if vital signs have been lost for >15 minutes; in this situation serious consideration should be given to withholding or ceasing resuscitation efforts.

This guideline is summarised on page 6.

Related Guidelines

[CPG 12: Resuscitative Thoracotomy](#)

[CPG 25: Death in Trauma](#)

Confirm Cardiac Arrest

40-50% of traumatic cardiac arrest calls received by ambulance services are not, in fact, in cardiac arrest at the time of clinician assessment. It is vitally important that loss of central pulse is confirmed prior to commencing the aggressive and rapid interventions outlined in this guideline.

If a pulse is felt, a rapid primary survey with targeted key interventions is indicated. In the peri-arrest state, with deteriorating vital signs, loss of peripheral pulses and reducing consciousness, these targeted interventions will closely resemble the treatment of traumatic cardiac arrest outlined here.

Consider Medical Causes of Cardiac Arrest

Patients frequently suffer traumatic injuries as a result of a medical event (e.g. a cardiac event, seizure, blackout, hypoglycaemia) while undertaking a hazardous activity, such as driving or working at height.

Information from the scene is crucial to gauge the likelihood of this. For example, a single vehicle collision in which the vehicle has veered off a straight section of road and suffered

minimal damage should immediately suggest the possibility of the driver's incapacitation before the trauma. Equally, if significant comorbidities are known about, these may suggest a medical cause of arrest. Finally, clinical signs (or absence of clinical signs) may not be in keeping with a traumatic cause of arrest.

If a solely medical cardiac arrest is strongly suspected, resuscitation should continue along a standard ALS approach, ensuring high quality CPR, early defibrillation, oxygenation and attention to the 4 Hs and 4 Ts.

Management of Traumatic Cardiac Arrest

Many traumatic pathologies can result in cardiac arrest – most of these are irreversible unless they occur inside a specialised operating theatre. Some traumatic pathologies are, however, rapidly reversible and the essence of treating traumatic cardiac arrest lies in the immediate treatment of these. They can be summarised by the mnemonic '**H.O.T.T.**'

- **Hypovolaemia**
- **Oxygenation**
- **Tension pneumothorax**
- **Tamponade**

Where possible, the following interventions should be carried out simultaneously, with "hands-off" coordination and overview maintained by the Team Leader.

Hypovolaemia:

1. Control external haemorrhage with direct pressure or tourniquet.
2. Control occult haemorrhage – apply pelvic binder and pull suspected long bone fractures to length.
3. Obtain large bore IV access or IO access, ideally at the proximal humerus.
4. Rapid bolus of O-Negative blood. Where blood is not available, use 0.9% Saline.

Oxygenation:

1. Provide ventilation breaths on 100% oxygen with a secure airway. This may be via a cuffed endotracheal tube but a supraglottic airway device (iGel™) is an effective alternative.

Tension Pneumothorax:

1. Bilateral open finger thoracostomies definitively treat and exclude tension pneumothorax. These should be performed in the mid-axillary line, 4th or 5th intercostal space, as soon as positive pressure ventilation breaths are commenced. Formal chest drain insertion is not required at this stage.
2. If a clinician who can perform finger thoracostomies is not immediately available, bilateral needle decompression is an alternative. It should be noted that needle decompression has a significant failure rate, especially if traditional IV access cannulae are used.
3. Should this intervention result in return of spontaneous circulation, tension pneumothorax may recur. Further clinical deterioration should prompt “refingering” or repeat needle decompression.

Tamponade:

The patient groups most likely to survive traumatic cardiac arrest are those with tension pneumothorax and those with witnessed loss of cardiac output caused by cardiac tamponade secondary to penetrating chest injury.

Consideration should be given to performing an immediate resuscitative thoracotomy in the context of:

1. Penetrating chest/epigastric trauma with loss of vital signs within 10 minutes OR
2. Blunt trauma with witnessed loss of vital signs and ultrasound evidence of cardiac tamponade.

Emergency Department and Pre-hospital clinicians should have immediate access to the equipment required and should regularly rehearse this procedure. In the MTC, a senior Cardiothoracic Surgeon should be contacted as soon as the decision is made to proceed to thoracotomy but the procedure should be performed immediately and should not wait for their attendance.

For further guidance see CPG 12: Resuscitative Thoracotomy.

The Role of Chest Compressions

Chest compressions may provide some blood flow and it is entirely reasonable to commence high quality compressions, particularly while rapidly establishing the history and mechanism leading to arrest. They should not be prioritised above, or interfere with, the immediate H.O.T.T. interventions. CPR alone (without attention to H.O.T.T. interventions) is unlikely to provide any benefit in traumatic cardiac arrest and is not recommended.

Termination of Resuscitation

Consideration should be given to ceasing resuscitation attempts if:

1. Following H.O.T.T. interventions, ROSC has not been achieved, or
2. There is ultrasound evidence of absent cardiac activity, or
3. Time without spontaneous circulation has been >15 minutes.

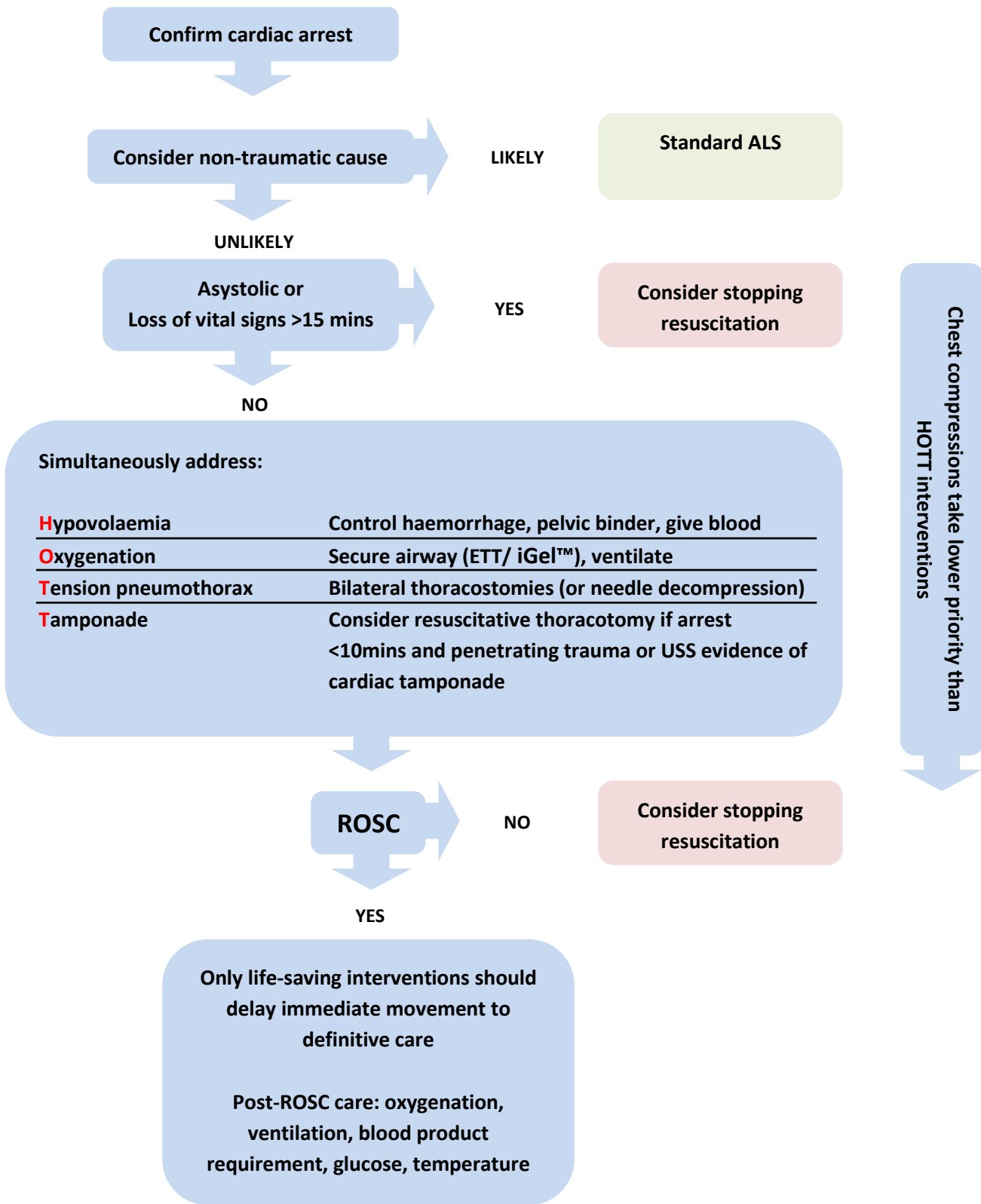
Post-ROSC Care

Following return of spontaneous circulation, all efforts should be made to expedite patient movement to definitive care. In the pre-hospital setting, reference should be made to the NIMTN Triage Tool; if transport time to the MTC is greater than 45 minutes, transport should be to the nearest Level 1 Emergency Department (AAH, ALT, CAH, CAU, UHD, SWAH).

In hospital, the decision regarding definitive care will depend on the most likely cause of traumatic cardiac arrest and this decision should be made by the Trauma Team Leader in conjunction with the relevant surgical teams. Most patients will benefit from CT Whole Body to identify the most urgent injuries. Some may be more appropriately moved to the operating theatre for emergent intervention. The latter are likely to be patients with penetrating chest injury who have undergone resuscitative thoracotomy or patients who remain grossly unstable in the context of suspected abdominopelvic haemorrhage.

Post-ROSC observation end-points will depend on specific injuries and comorbidities but care should include meticulous attention to the following:

1. Oxygenation
2. Ventilation
3. Blood pressure and blood product requirement
4. Glucose
5. Temperature



References

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