Magpas AIR AMBULANCE

STANDARD OPERATING PROCEDURE

2.10 Post resuscitation (ROSC) care

Position responsible: Medical Director
Approved by: CGC

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Related Documents	SOP 2.1 Adult cardiac life support SOP 2.2 Managing myocardial infraction SOP 6.0 Pre-hospital emergency anaesthesia
Further information	Resuscitation Council UK Guidelines

1.0 Background

1.1 Successful return of spontaneous circulation (ROSC) following an out of hospital cardiac arrest is the first step towards the goal of complete recovery. The complex pathophysiological processes that occur following whole body ischaemia during cardiac arrest and the subsequent re-perfusion response during CPR and following successful resuscitation have been termed the post-cardiac arrest syndrome. The post-cardiac arrest syndrome comprises:

- post-cardiac arrest brain injury
- post-cardiac arrest myocardial dysfunction
- systemic ischaemia/reperfusion response
- persistent precipitating pathology.

1.2 Care of ROSC patients should follow a defined care bundle. This bundle of care aims to address the elements of the post cardiac arrest syndrome.

1.3 This SOP applies to non-traumatic cardiac arrest in both adults and children.

2.0 Objectives

2.1 To standardise the optimal approach to the management of patients with return of spontaneous circulation following an out of hospital cardiac arrest.

3.0 Assessment

3.1 A detailed primary survey should be undertaken with the priority of identifying immediate threat to life and initial treatment priorities.

3.2 Concurrent to the patient assessment other team activity should include supporting initial treatment priorities as identified in the primary survey and directing peripheral activity in order to initiate the ROSC care bundle, i.e. establishing monitoring, ensuring adequate vascular access, etc.

4.0 Care Bundle

4.1 Airway management & Pre-Hospital Emergency Anaesthesia

4.1.1 Ensure the airway is secured with an endo-tracheal tube. If this was not done intra-arrest this may now require a pre-hospital emergency anaesthetic.

4.1.2 Airway management should be applied in a stepwise process which should be guided by the start state of the airway and the physiological state of the patient.

4.1.3 Immediate airway management

- Ensure 100% oxygen given and two full oxygen cylinders are available
- Ensure suction unit available

4.1.4 No airway in place

- use BVM and adjuncts to provide immediate ventilation
- set up airway kit dump
- give ketamine titrated to need (up to 1.0mg/kg – see 4.1.7 for guidance)
- give rocuronium 1mg/kg
- wait 60 seconds
- intubate with Plan A

4.1.5 iGel in place

- use BVM to provide immediate ventilation
- if ineffective, remove iGel and use BVM and adjuncts and continue
- if effective, consider extrication and optimal positioning before proceeding with intubation.
- set up airway kit dump
- give ketamine titrated to need (up to 1.0mg/kg – see 4.1.7 for guidance)
- give rocuronium 1mg/kg
- wait 60 seconds
- intubate with Plan A

4.1.6 ETT (endotracheal tube) in place

- use BVM to provide immediate ventilation
- check capnography – confirm presence of CO2 and length <23cm at the teeth. If no CO2, rapidly troubleshoot (connected, sample line), if not resolved remove ETT and follow steps in 4.1.4
- give ketamine titrated to need (up to 1.0mg/kg – see 4.1.7 for guidance)
- give rocuronium 1mg/kg

4.1.7 Induction/Sedation dose of ketamine

- Lively / agitated and MAP>70mmHg
  - Give ketamine 1mg/kg
- Not lively but MAP>70mmHg
  - Give ketamine 0.5mg/kg
- Agonal / peri-arrest / MAP<70mmHg
  - No bolus sedation

4.2 Ventilation

4.2.1 Mechanical ventilation should be established at the earliest opportunity in order to optimise oxygenation and ventilation.

4.2.2 The following ventilation strategy should be used:

- Use Duopap mode
- Adjust P_{HIGH} to achieve 7ml/kg tidal volume
- PEEP = 5cmH_20
- Initial F_iO_2 = 1.0
- If S_pO_2 trace good titrate F_iO_2 in 0.1 increments (to a minimum of 0.6) to achieve SpO2 94-98% (avoid both hypoxia and hyperoxia)
- Adjust frequency to maintain E_tCO_2 4.0-5.0
- *NB - E_tCO_2 <4.0 – may be a sign of falling cardiac output / impeding re-arrest rather than hyperventilation*

4.2.3 Consideration should be given to positioning the patient in order to support optimal ventilation, i.e. head up.

4.2.4 Insert a naso/orogastric tube. Place red sticker to alert staff that the tube has not had placement confirmed.

4.3 Monitoring

4.3.1 All patients will require multimodality monitoring. If Ambulance Service monitoring has been used during the initial arrest management, once ROSC has been established and prior to any further interventions, the Magpas monitor should be applied.

4.3.2 Minimum monitoring standards should be applied and include:

- S_pO_2
- 3-lead ECG
- NIBP
- E_tCO_2

4.3.3 If the patient remains unstable consideration should be given to remaining on defibrillation pads. Pad placement should also be considered based on the potential needs of the patient, i.e. for transcutaneous pacing AP positioning is preferred.

4.3.4 A 12 lead ECG should be acquired at the earliest opportunity in order to guide clinical and disposition decision making.

4.3.5 All patients should have a blood glucose measurement and this should be corrected if less than 4mmol.

4.3.6 All patients should have temperature measured. Pyrexia should be avoided, patients with temperatures >36°C should be actively cooled as best as possible.

4.4 Vascular Access

4.4.1 Ensure at least one point of working vascular access.

4.4.2 Ideally a second point of vascular access should be established.

4.4.3 Attach a pre-flushed dual-lumen "octopus" to prepare for infusions.

4.5 Blood Pressure Management

4.5.1 Management should aim to maintain a MAP >70mmHg in order to support cerebral perfusion.

4.5.2 Fluid should be used as an initial means of resuscitation for low blood pressure, boluses of 250ml should be used to restore MAP >70mmHg. However, in patients with a suspected cardiac aetiology fluid resuscitation should be avoided where possible unless there is suspected right ventricular involvement, in which case a 250-500ml fluid bolus should be administered.

4.5.3 Vasoactive drugs should be considered a supportive therapy. Choice of agent is a clinical decision. A suggested strategy is to use metaraminol (0.5mg boluses) if the heart rate is sufficient (>60) otherwise use adrenaline 1:100,000 (10mcg boluses) or ephedrine (6mg boluses).

4.5.4 If the patient is shocked due to an arrhythmia then follow the appropriate peri-arrest arrhythmia guideline.

4.5.5 If the patient is shocked due to cardiogenic shock secondary to a confirmed STEMI and is considered not stable for transfer, then reperfusion with thrombolysis should be considered. This should be discussed with the receiving Heart Attack Centre. All ROSC patients receiving thrombolysis (including intra-arrest) should get a dose of heparin.

4.6 Maintenance of Anaesthesia

4.6.2 Ongoing maintenance of anaesthesia should be by a ketamine infusion with boluses of rocuronium. The dosing strategy will be based on the physiology of the patient.

- MAP>70mmHg
  - Give ketamine 0.25mg/kg if required
  - Commence ketamine infusion 0.1ml/kg/hr (e.g. 7mls/hr if 70kg) using pre-filled syringe

- MAP<70mmHg
  - No bolus sedation
  - Commence ketamine infusion 0.1ml/kg/hr (e.g. 7mls/hr if 70kg) using pre-filled syringe

4.6.3 If the maintenance infusion is started immediately following induction then the bolus can be omitted.

4.6.4 If required make adjustments in 20% increments (typically 1.0-2.0ml). *NB - Adjustments to infusion rates will not have a significant impact on physiology for 30+ minutes.*

4.6.5 If patient shows significant signs of discomfort / distress or becomes hypertensive (MAP >100mmHg) use ketamine bolus (up to 0.5mg/kg) and increase infusion rate by 20%.

4.6.6 On arrival at hospital, offer ketamine syringe to receiving team for ongoing infusion.

4.6.7 Boluses of rocuronium 0.5mg/kg should be given every 30 minutes.

5.0 Patient Disposition

5.1 Appropriate patient disposition is a crucial aspect of post resuscitation care. If a commissioned pathway exists this should be followed, otherwise the patient should be taken to the nearest hospital.

5.2 In the case of cardiac arrest secondary to STEMI, the PPCI pathway should be followed and the patient taken to the nearest Heart Attack Centre. This pathway includes patients who are intubated and ventilated.

5.3 In the case of other suspected cardiac causes or patients with initial rhythm of VF, conveyance to a Heart Attack Centre should be discussed with the team at the nearest centre.

5.4 In the case of children consideration should be given to having a discussion with a centre that has a PICU.

5.5 Transport modality decisions should be based on expected travel time, location of helipad (primary vs secondary) and the stability of the patient. If any concern the default modality should be by land.

5.5 If there is concern over the stability of the patient and high risk of re-arrest, the team should ideally have access to a mechanical compression device in order to support safe and effective chest compressions in-transit.

5.6 Prior to departing scene ensure the ROSC bundle checklist (Appendix 1) is completed.

Appendix 1 – ROSC Bundle Checklist

Airway
- Secure airway with ETT - Establish multi-modality monitoring (ECG, SpO2, NIBP, EtCO2)
Breathing
- Establish mechanical ventilation @ 7ml/kg tidal volume - PEEP 5cmH_20 - Titrate F_iO_2 in 0.1 increments (to a minimum of 0.6) to achieve SpO2 94-98% - Adjust ventilation to achieve E_tCO_2 4.0-5.0 - Site naso/oro-gastic tube
Circulation
- Establish 2 points of vascular access - Maintain MAP >70mmHg - Acquire early 12 lead ECG - Treat arrhythmias as required (as per RCUK guidelines)
Disability
- Ensure adequate neuromuscular blockade (as per SOP) - Provide adequate sedation (as per SOP) - Ensure blood glucose >4mmol - Ensure temp <37°C
Disposition
- Heart Attack Centre if meets PPCI criteria - Consider HAC if initial presenting rhythm of VF - Consider PICU centre if <18yo - Nearest ED for all other causes

Appendix 2 – Induction and Maintenance (in ROSC) Aide-Memoire

Induction

Induction/Sedation dose of ketamine

- Lively / agitated and MAP>70mmHg
  - Give ketamine 1mg/kg

- Not lively but MAP>70mmHg
  - Give ketamine 0.5mg/kg

- Agonal / peri-arrest / MAP<70mmHg
  - No bolus sedation

Maintenance

- MAP>70mmHg
  - Give ketamine 0.25mg/kg if required
  - Commence ketamine infusion 0.1ml/kg/hr (e.g. 7mls/hr if 70kg) using pre-filled syringe

- MAP<70mmHg
  - No bolus sedation
  - Commence ketamine infusion 0.1ml/kg/hr (e.g. 7mls/hr if 70kg) using pre-filled syringe

