# HELICOPTER OPERATING PROCEDURE

## Post Cardiac Arrest Syndrome

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## 1. Introduction:

Greater Sydney Area HEMS frequently transports patients following return of spontaneous circulation (ROSC) following cardiac arrest (CA). Several interventions have been shown to improve survival and neurological outcome if instituted in the immediate post-arrest phase and a range of national and international resuscitation guidelines (such as ILCOR\(^1\) and ARC\(^2\)) make recommendations about the management of post cardiac arrest syndrome.

## 2. Scope:

Clinical crew

## 3. Background:

Post Cardiac Arrest Syndrome (PCAS) describes the spectrum of organ dysfunction following ROSC in patients suffering cardiac arrest.

The four key components of PCAS are\(^3\):
- Post-cardiac arrest brain injury
- Post-cardiac arrest myocardial dysfunction
- Systemic ischaemia/reperfusion response
- Persistent precipitating pathology

Interventions which address one or more of these components may improve survival and neurological outcome\(^3\).

## 4. Targeted critical care interventions:
- Airway protection and mechanical ventilation
- Controlled reoxygenation (Sa02 95-98%)
- Early haemodynamic optimisation
- Targeted temperature management
- Control of seizures
- Control of blood glucose level
- Addressing persistent precipitating pathology
4.1 **Airway protection and mechanical ventilation**
Patients with decreased level of consciousness, persistent hypoxia or significant hypotension following ROSC should have their airway secured by rapid sequence intubation and mechanical ventilation instituted. There is a well documented association between hypocarbia and cerebral ischaemia after cardiac arrest. Ventilation to a PaCO2 of 35-40mmHg is appropriate. An arterial blood gas should be taken to correlate ETCO2 with pCO2. Given the SIRS-like nature of the post-cardiac arrest syndrome, consider a lung-protective ventilation strategy.

4.2 **Controlled reoxygenation**
Some recent studies have shown harmful effects from both hyperoxia (PO2>300mmHg) and hypoxia (PO2 <60mmHg). The ARC recommend titrating FiO2 down to give oxygen saturations > 94%. Oxygen saturations and ventilator settings throughout the retrieval should be documented on the case sheet.

4.3 **Early haemodynamic optimisation**
Survivors of cardiac arrest frequently experience haemodynamic instability due to PCAS which may persist several hours after ROSC. There is a reduction in cardiac index which is often reversed after 24 hours (myocardial stunning), and a peripheral SIRS-like syndrome. It is important to maintain myocardial, cerebral and end-organ perfusion during this time. It is reasonable to use a combination of fluids and vasoactive infusions in post-arrest haemodynamic management. Trials of therapeutic hypothermia have shown that 30ml/kg of crystalloid is well tolerated. The optimum MAP has not been established. A balance is sought between maintaining CPP whilst not straining the stunned heart. The ILCOR / ARC recommend a MAP of 65-100, taking into account the patient’s known normal blood pressure. It is reasonable to continue an infusion of an anti-dysrhythmic drug that successfully restored a stable rhythm during resuscitation although prophylactic anti-dysrhythmics have not be shown to improve survival. Patients in cardiogenic shock should only be retrieved to a centre which can provide PCI and intra-aortic balloon pump therapy.

4.4 **Targeted Temperature Management**
Patients with significantly decreased level of consciousness which may be defined as “not following verbal commands in a meaningful way” post ROSC should be intubated, ventilated and considered for Targeted Temperature Management (“therapeutic hypothermia”). Cooling interventions should be applied as soon as possible after the cerebral insult, but may be effective if instituted after up to 6 hours.
If possible, discuss therapeutic hypothermia with the referring hospitals during the conference call.

4.5 **Contraindications:**
- Polytrauma
- Pregnancy

4.6 **Relative contraindications:**
- Pre-existing coagulopathy

Note: Cardiogenic Shock should no longer be considered a C/I to therapeutic hypothermia. Cooling should be initiated by infusion of 30ml/kg of cold (4 degree C) crystalloid over 30 minutes. Apply mixed ice/water bags to neck, axillae and groin. Core temperature should be measured continuously using nasal, oesophageal or rectal temperature probe via the propaq with a target of 32-34C. Ensure adequate sedation and analgesia. Neuromuscular blockade is usually necessary to prevent shivering. Therapeutic hypothermia is associated with a fall in potassium. Potassium should be cautiously replaced to maintain a level over 3.0mmol/l.

4.7 **Control of seizures**
There is an increased risk of seizure in patients with PCAS. They will not be clinically apparent once the patient is paralysed. Any suspected or diagnosed seizures should be treated aggressively with benzodiazepines and phenytoin.

4.8 **Control of blood glucose level**
Hyperglycaemia is common following cardiac arrest. Although there is no proven survival benefit to tight glycaemic control, there is an association between high glucose and poor neurological outcome after cardiac arrest. Check the blood sugar level, and consider treating with an insulin infusion if persistently greater than 10mmol/l. Recheck frequently to avoid levels below 6mmol/l.

4.9 **Addressing persistent precipitating pathology**
Management of ACS. Coronary artery disease is present in the majority of patients with OHCA. Ongoing ST elevation / LBBB is a reasonable indicator of ongoing coronary
artery occlusion, although the absence of ECG findings does not exclude such occlusions.
Aspirin should be administered to all patients if ACS is a likely underlying diagnosis.
Discuss with the receiving cardiology team to ensure that urgent percutaneous coronary intervention (PCI) is available at the receiving centre.
If there are no facilities for immediate PCI, in-hospital thrombolysis is recommended for patients with ST elevation who have not received prehospital thrombolysis and who are not in cardiogenic shock. Other causes
Consider other causes of cardiac arrest such as pulmonary embolism, intracranial haemorrhage or toxicological causes.

4.10 Prognostication
No clinical or neurological examination finding has been demonstrated to reliably prognosticate in the first 24hrs following ROSC particularly where targeted temperature management has been instituted.

5. Review Date
Aug 2012

6. References


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