

Targeted Temperature Management and Hypoxic-Ischaemic Encephalopathy in DCCM

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1. Purpose of policy

- To control core body temperature after resuscitation from cardiac arrest (of presumed cardiac origin) in the Department of Critical Care Medicine (DCCM) within Auckland District Health Board (Auckland DHB).
- To assist in management of patients with hypoxic-ischaemic encephalopathy after resuscitation from cardiac arrest.

2. Responsibility

All medical and nursing staff providing care and treatment for post-cardiac arrest patients in DCCM.

3. Guideline management principles and goals

Following the publication of two studies (Hypothermia after Cardiac Arrest Study Group, 2002; Bernard, 2002) showing modest benefit (Safar, 2002) (16% and 23% (Bernard, 2002) absolute increase in the frequency of survival with favourable CNS outcome) from the use of induced short-term (12-24 hours) moderate hypothermia (~33°C) in post-cardiac arrest hypoxic-ischaemic encephalopathy (HIE), this intervention was initiated in DCCM in May 2002. The publication of a larger study (Neilsen et al, 2013) comparing management at a core temperature either 33°C or 36°C degrees which showed no difference in outcome has led to this intervention being modified in this protocol and now termed targeted temperature management (TTM).

Prognostication in HIE is becoming increasingly evidence-based and this protocol now represents the processes which will be followed in the DCCM to inform prognosis and guide therapy after TTM.

4. Inclusion criteria

Patient selection for targeted temperature management will be determined by the duty intensivist on a case-by-case basis. Patients must:

- Have been resuscitated from a cardiac arrest
- Have impaired CNS function (best motor score of 4 – withdrawal – or worse) thought to be due to hypoxic-ischaemic encephalopathy and not due to other conditions
- Patients of any age may be considered for treatment
- Be accepted by the duty intensivist for DCCM admission, and the duty intensivist must also agree to use TTM before any cooling is undertaken.

5. Exclusion criteria

Patients may not receive this treatment if:

- The duty intensivist believes that this patient should not receive this treatment (e.g. very poor patient clinical condition). This therapy is not usually applied in cardiac arrest as the result of confirmed hanging.

Note: All other treatments, which may ordinarily be appropriate in the setting of recent cardiac arrest (including coronary angiography and percutaneous intervention, thrombolysis, heparin or aspirin), are not contra-indicated by TTM and should continue to be used, if indicated.

6. Process of treatment

6.1 Patient selection

The patient is seen and assessed by the DCCM registrar or intensivist, either in the DEM or in one of the hospital wards, following resuscitation from cardiac arrest.

The nature of the arrest (primary or secondary) and first rhythm (VT/VF or other) are ascertained, together with the best motor score at least 10 minutes after return of spontaneous circulation (ROSC) and the state of the circulation and stability of cardiac rhythm. Other usual clinical information (prior health status, quality of life, severe co-morbidity, and complications of CPR) is also obtained. The DCCM registrar discusses the patient with the duty intensivist with respect to suitability for DCCM admission and for TTM.

6.2 Commencing therapy

If the duty intensivist agrees that this is a suitable patient, treatment may begin immediately (e.g. in the Emergency Department – ED) or may be briefly deferred until admission to the DCCM (e.g. patients in other wards at the time of the arrest).

Note: Decrease FiO₂ as soon as possible for SpO₂ 93-96% (including in the Emergency Department)

6.3 Physiological parameters to aim for:

- SpO₂ 94-98%; PaCO₂ 4-6.0kPa; MAP 70-90 mmHg

6.4 Sedation

To prevent shivering and maintain the core-temperature target, patients treated with TTM may need sedation (\pm muscle relaxation). This should be:

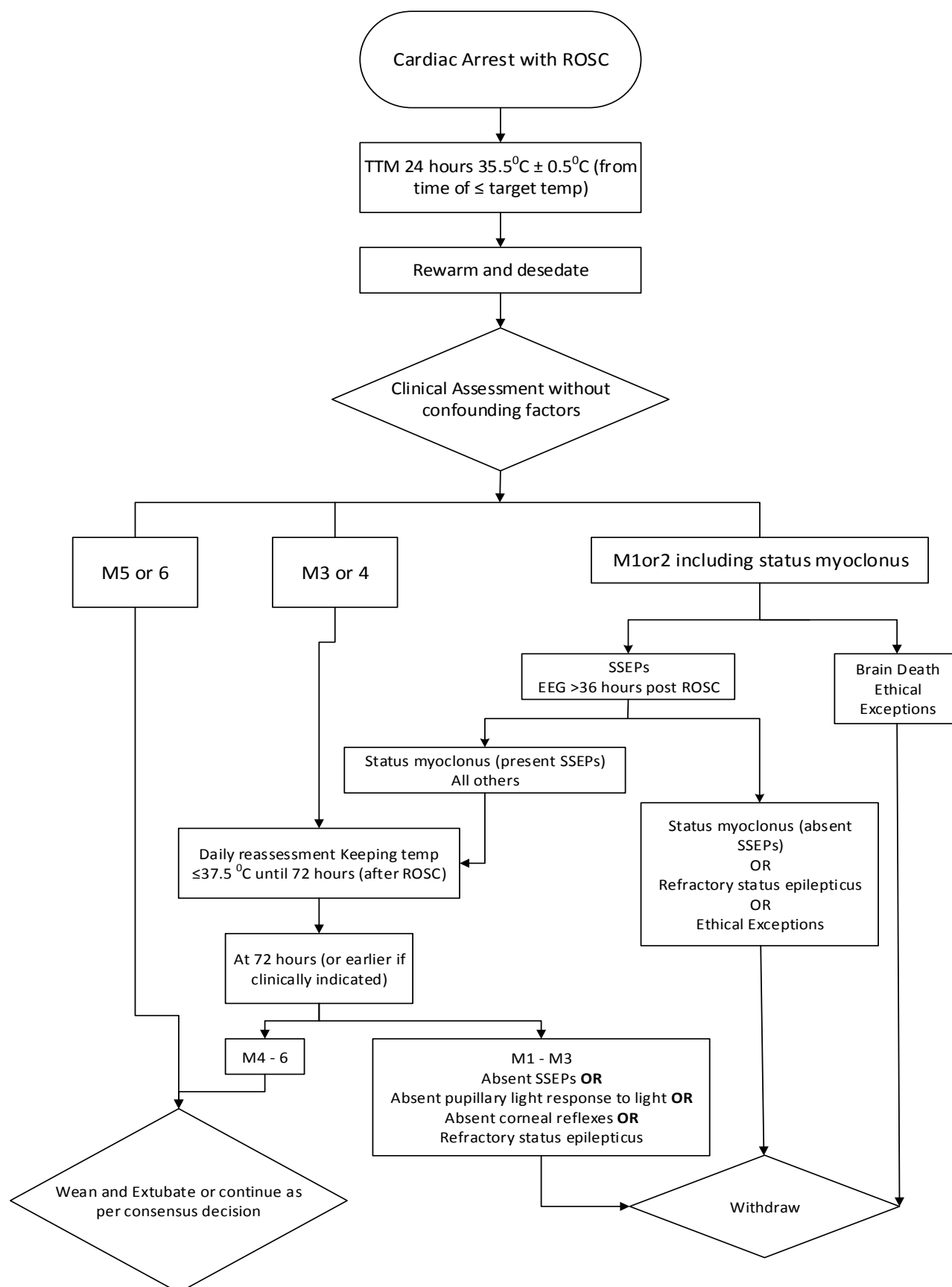
- Sedation with a mixture of opioid (e.g. fentanyl 20-50 microgram/hr or morphine 2-5 mg/hr), and
- Propofol (e.g. 1-2 mg/kg/hr) infusions, and
- Appropriate muscle relaxant prn rocuronium (no infusion) or atracurium prn or by infusion if necessary to limit shivering
- A small dose of chlorpromazine (2.5 mg IV) may be used in addition, to aid cooling if needed
- Elderly, small or frail patients should start with doses of opioid and propofol at the lower end of these ranges.

6.5 Process

Step	Action
1.	Note on 24 hour chart CR5710 (see Associated documents) the time when active cooling commenced. This will be when the temperature is at or below target.

Step	Action
1.	In DCCM, patients will be cooled and TTM maintained with the use of a Blanketrol II blanket placed above and below the patient, set to Automatic with the set point at 35.5°C.
2.	The desired patient temperature range will be 35.5 ± 0.5°C and the registrar will chart this range.
3.	<ul style="list-style-type: none"> Patients will usually have a temperature of 35.5°C after ROSC when assessed for TTM. If not, they will be cooled until their core temperature is under 36°C and the nurse will record this time on the chart 24 hour chart CR5710 (see Associated documents). If the patient is ≤ 33°C, they should be warmed to 33°C at 0.5°C/hr. They are then allowed to passively rewarm to 35.5°C.
4.	24 hours after the time that the core temperature fell under 36°C, the blanket will be removed and the sedative, opioid and muscle relaxant infusions will be stopped (assuming that other extracranial factors are stable and that a sedative-free clinical examination is appropriate at this time).
5.	<ul style="list-style-type: none"> The new desired temperature range will be charted as 36-37.5 °C. Some patients may require additional blood volume expansion and inotrope requirements should be closely watched.
6.	<p>Subsequent therapies will depend on the results of a sedative-free clinical assessment of CNS function:</p> <ul style="list-style-type: none"> Patients who do not obey commands will have their temperature controlled (using paracetamol, light surface cooling and sedation if necessary) at 36-37.5 °C for a further 48 hours (i.e. until ~72 hours after ROSC) unless they have evidence of very severe brain damage and it is appropriate to withdraw intensive therapy (see flow chart). Patients who obey commands will be weaned from ventilatory support and extubated as soon as extracranial factors allow.
7.	Further management should follow the prognostication pathway.

7. DCCM cardiac arrest prognostication flowchart



8. Supporting evidence

- Hypothermia after Cardiac Arrest Study Group. (2002). Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *New England Journal of Medicine*, 2002(346), 549-556.
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- Nielsen, N., Wettersley, J., Cronberg, T., Erlinge, D., Gasche, Y., Hassager, C., ... & Pellis, T. (2013). Targeted Temperature Management at 33 degrees C versus 36 degrees C after Cardiac Arrest. *New England Journal of Medicine*, 369(23), 2197-2206.
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- Golan, E., Barrett, K., Alali, A. S., Duggal, A., Jichici, D., Pinto, R., ... & Scales, D. C. (2014). Predicting neurologic outcome after targeted temperature management for cardiac arrest: systematic review and meta-analysis. *Critical care medicine*, 42(8), 1919-1930.

9. Associated documents

- CR5710 Department of Critical Care Medicine 24 Hour Chart

10. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

11. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed **before** the scheduled date, they should contact the owner or [Document Control](#) without delay.