

Protocol for Normothermic (less than 37.1C Degrees) Targeted Temperature Management (TTM) in Critical Care Post Cardiac Arrest

This checklist/protocol provides instructions to health care providers for the initiation, maintenance and discontinuation of **NORMOTHERMIC** (less than 37.1C) Targeted Temperature Management (TTM) in the Adult Critical Care Units, London Health Sciences Centre (LHSC).

For patients being treated with hypothermic TTM, use the Protocol for Hypothermic TTM.

The goal is to reach the target temperature as quickly as possible after ROSC. Fever avoidance (temperature less than 37.1C) is extremely important. About half of patients who are being treated with normothermic TTM may still require active cooling to keep their temperature within target. This protocol should only be used in patients who are not spontaneously following commands.

Maintain target temperature if investigations are required. Patients should not be allowed to waken or breathe spontaneously; if they do, sedation and analgesia is inadequate. This checklist covers the 72 hours of TTM protocol.

Central venous and arterial access should be established (for rapid and secure vascular access for the potential administration of cold fluids, vasoactive agents and/or pacemaker insertion. Cooling *should not be delayed* for the insertion of a CVC/arterial line.

Time Points (in Hours):

T1: Time point when patient first achieves a temperature below 37.1C

T40: Time point for the end of the period of deep sedation

T72: End of targeted temperature management period

T1 – T40: Time period for the maintenance of deep sedation and temperature less than 37.1C

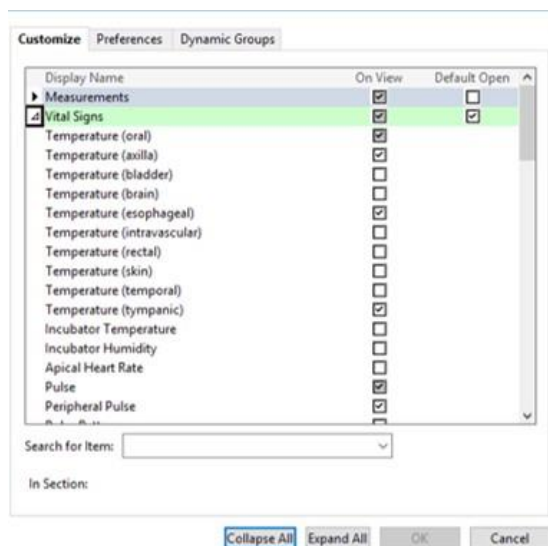
T40-T72: Fever prevention period; keep temperature less than 37.1C. If temperature exceeds target, sedation and/or other cooling methods may need to be reinstated.

INITIATION OF NORMOTHERMIC (less than 37.1C) TTM (T1 to T40): PROTOCOL REQUIREMENTS

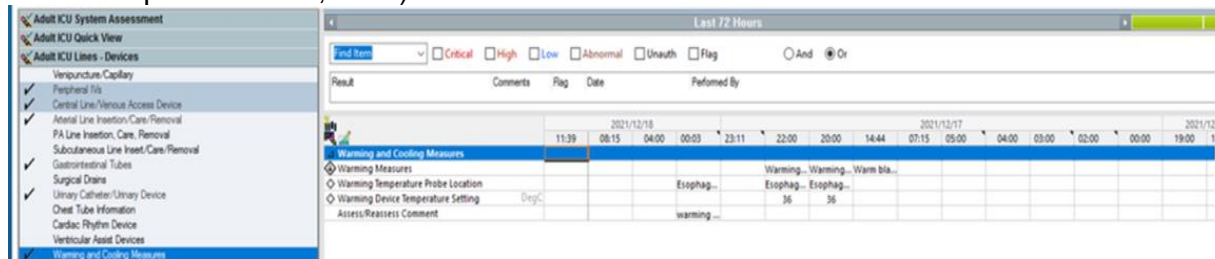
- If patient has indications of an acute STEMI, Code STEMI should be activated. Temperature control is not a contraindication to coronary intervention.
- If patient has cardiogenic shock or persistent arrhythmia, Critical Care Consultant/Senior Resident should engage Cardiology STAT for cardiac catheterization consideration.
- Administer ASA, antiplatelet agents, anticoagulant and/or fibrinolytics as per orders for Acute Coronary Syndrome.
- Target Temperature: Less than 37.1C
- Standard analgesia orders should be discontinued and replaced with BOTH analgesic and sedative orders contained within the TTM protocol to provide anaesthetic level dosing.

DOCUMENT WARMING AND COOLING INTERVENTIONS

Ensure that the correct temperature is recorded. Label the bedside temperature as esophageal. If necessary, go to IView – Vital Signs – Custom View and Vital Signs to select Temperature Esophageal.



Document when warming and cooling stop and start. In the comments, identify strategy used (e.g., cold saline, cooling/warming blanket, acetaminophen initiated, NMB). Document when warming and cooling stop and start. In the comments, identify strategy used (e.g., cold saline, cooling/warming blanket, acetaminophen initiated, NMB).



STEPS TO ACHIEVING NORMOTHERMIA

- Notify RRT STAT to ensure full controlled ventilation is established. Switch humidifier to 32C (NIV mode) if patient temperature is greater than 36C or if patient is requiring other active cooling measures to maintain target temperature.
- Quickly perform a BRIEF baseline neurological assessment including GCS, pupils, corneal reflex, gag and cough, then PROMPTLY initiate sedation by bolus administration.
- Initiate continuous nasopharyngeal or esophageal temperature monitoring ([probe insertion instructions](#)) and document hourly. A bladder or pulmonary artery catheter can also be used for core temperature monitoring. Rectal temperature monitoring can be used temporarily but can be less accurate if stool is present. Monitor temperature continuously and document hourly until T72.
- Administer a liberal bolus dose of narcotic and sedative. If temperature is greater than 37C, **administer an initial 250 ml cold saline bolus immediately following narcotic and sedative administration.** Do not delay cooling until infusions are initiated.
- Repeat 250 ml** cold normal saline bolus using 250 - 500 ml refrigerated bags (to ensure solution remains cold to end of infusion) to a maximum of 2000 ml if temperature remains greater than 37C.

- Repeat narcotic bolus and initiate infusions (start cooling as soon as first bolus dose is given); don't wait until infusion is started). Titrate narcotic and sedative infusions to ensure the following:
 - No response to a tap on the forehead
 - MAAS 0
 - CPOT 0
 - No respiratory effort

Patients should NOT be allowed to waken or trigger the ventilator during first 40 hours.

- Once above criteria is maintained with narcotic and sedative infusions, administer a bolus dose of neuromuscular blocking agent if necessary for temperature management or ventilator control. Not all normothermia patients will require cold saline or neuromuscular blockage. Rocuronium is preferred (cost) as an infusion unless severe renal or hepatic impairment.
- Repeat neuromuscular blocking agent bolus and/or initiate an infusion if VAMAAS 0A and CPOT 0 *AND* patient is making respiratory effort/triggering ventilator, shivering or if target temperature remains above goal. Always treat with narcotic or sedative first to ensure anesthetic levels of sedation.
- If temperature is greater 37C, place cooling blanket over TOP surface of patient. Place a light sheet between the patient and blanket (no cooling blanket under patient (pressure injury risk) or directly in contact with skin (frost bite risk).
- Wrap arms and legs in a flannelette blanket to prevent shivering and frost-bite if cooling blanket is required.
- Add ice packs around neck, in axilla and groin if temperature remains greater than 37C.
- If patient is receiving CRRT, turn heater to off.
- Identify the time point when target temperature is first achieved. This will be T1.
- If patient's temperature is spontaneously below target, do not initiate active warming unless the temperature is less than 32C. Discontinue warming devices when temperature reaches 33C.
- If triggering on the ventilator is noted or patient shows any signs of responsiveness or movement, bolus the patient with additional narcotic and increase the maintenance infusions of sedatives until deep anaesthesia is achieved. Do not allow the patient to lighten during first 40 hours.
- Initiate **regular** dose acetaminophen (as soon as temperature reaches 36.5C and continue QID. Once started, continue for duration of protocol. If oral route is contraindicated, obtain an order for rectal administration.

SEIZURE MONITORING

- Initiate CEEG (for all patients on normothermia protocol). Continue until T72, patient is awake or discontinued by provider (whichever comes first).
- Consult Neurocritical care (Monday to Friday) if seizure activity is suspected or myoclonus observed. Consult Neurology on evenings and weekends.
- Neurocritical care is able to view CEEG information from the central station from either campus. If you identify something concerning on the CEEG, identify the exact time of the event to help NCC isolate the CEEG finding in full disclosure.
- Although not 100% reliable, an SEF of less than 4 suggests that the patient is deeply sedated.
- The preferred treatment for myoclonus is valproate. Critical Care physicians may order the first dose but Neurology or Neurocritical care consultation is required for ongoing approval.
- Note that neuromuscular blocking agents are not anticonvulsants but they can mask detection of a motor seizure.

MONITORING, MAINTENANCE AND NURSING CARE

- Send TSH for patients who are spontaneously hypothermic at admission.
- If it is difficult to maintain target temperature or there are any other signs/risk factors for possible sepsis, patient should be pan cultured.
- If a patient's temperature is spontaneously below 35C, do not actively re-warm unless temperature is less than 32C. Stop active rewarming when temperature reaches 33C.
- Review MAP target with provider (65 for most patients). To date, there has not been an optimum MAP target in the post-arrest patient.
- Ensure that ECG, electrical cords and/or pacemaker cables do not come in contact with wet linen
- Continue with routine turning and skin care. Monitor for myocardial irritability during position changes.
- Monitor closely for signs of pressure injury. Do not place cooling blanket under patient (increases pressure injury risk).
- For neurological vital signs, monitor pupils and CEEG changes only until T40, then resume full neuro assessment (pupils should respond when neuromuscular blocking agents are in use).
- Monitor for signs of frostbite/dusky circulation.
- Keep eye lids closed at all times and provide lacrilube **ointment** per order.
- If anti-arrhythmics are required, amiodarone is the usual first line agent unless contraindicated.
- Initiate enteral feeding upon admission unless contraindicated. Initiate enteral feeding at 15 ml/hr (elevated HOB as tolerated) and notify Dietitian for ongoing nutritional assessment.
- Initiate DVT and GI prophylaxis as per standard care.
- If renal function deteriorates and patient is receiving rocuronium, review neuromuscular blocking agent with provider.

END OF SEDATION AND ONSET OF FEVER PREVENTION PERIOD (T40 to T72)

Avoid rapid rewarming. **The goal for rewarming is a target of 0.2-0.5 degrees/hr.**

- Continue to measure **core** temperature (not oral or axilla) continuously and document hourly until T72
- Remove any ice packs or wet linen. Apply a dry flannelette sheet.
- If neuromuscular blockers are in use, stop infusion at T40 if temperature is < 37C.
- Stop narcotic and sedative infusions 2 hours after stopping neuromuscular blocking agents if temperature is greater than 35C and less than 37.1C. Review timing with provider if patient is in renal failure and received rocuronium.
- Rewarm passively with a goal of 0.2C – 0.5C increase per hour.
- Once infusions are discontinued, continue with PRN narcotics and sedatives as required for symptom management or temperature control.
- If temperature exceeds 37C between T40 and T72 and patient is NOT fully awake, reintroduce cooling in the following sequence to maintain temperature below 37C:
 1. Minimize clothing/linen
 2. Administer regular dose acetaminophen as ordered
 3. Use non-heated humidification on the ventilator circuit and CRRT circuit.

4. Restart sedation until temperature is within target or VAMASS 0 (lowest dose required)
 5. Initiate cooling blanket
 6. Add ice packs in axilla and groin; wrap limbs in flannelette
 7. Initiate neuromuscular blockade
 8. Rule out sepsis
- If patient is obeying commands after T40, discontinue Targeted Temperature Management protocol.

ACTIVE REWARMING (IF REQUIRED) INITIATE AT T48 IF REQUIRED

- If temperature remains less than 35C at T48 active warming with an external surface warming device may be initiated.
- Turn warmer off as soon as temperature reaches 36C

POST PROTOCOL

- Continue CEEG until order received to discontinue
- Most patients with persistent coma at 72 hours will require neuroimaging (CT head, MRI brain) and formal EEG.
- Patients should have assessment of cardiac function (formal echocardiogram or POCUS) and be considered for cardiology follow-up if arrest was cardiac in nature
- Review with team the need for Neuro Critical Care Consult (usually at 72 hours or later).
- Neuro prognostication should be delayed until 96 hours or later

December 15, 2021; January 27, 2023