Normothermia for Neuro-protection

NeuroICU Guidelines for Normothermia

Disclaimer

Prior to making any medical decisions, please view our disclaimer.

Goal

Elevated body temperature and the associated increase in cerebral metabolic rate can be deleterious to the brain in certain circumstances. This guideline can be used to induce normothermia in patients who are refractory to conventional fever treatment.

Patient eligibility

1. Presence of fever (T ≥ 38°C or 101°F by reliable and reproducible means, including superficial artery temporal artery probe, continuously bladder temperature measurement or rectal thermometry), that is refractory to initial therapy with acetaminophen 650 mg every 4 hours, cooling blankets, and ice packs. Refractory is defined by a lack of temperature reduction within 2 hours of these interventions.
2. Patient must undergo an appropriate infectious disease work-up and anti-microbial therapy initiated if indicated.
3. Alternative sources of fever should be investigated as appropriate, including lines/catheters, medications, deep venous thrombosis, cholecystitis, pancreatitis, sinusitis, etc.
4. Patients not to be considered for induced normothermia:
   o Contraindications to induced temperature reduction, such as patients with known hematological dyscrasias which affect thrombosis, (cryoglobulinemia, sickle cell disease, serum cold agglutinins), or known deep venous thrombosis (for femoral catheter approach only)
   o Peripheral vasospastic disorders
   o Contraindication for central venous catheter placement (for catheter-based approach only)
   o Known or suspected diagnosis of heparin induced thrombocytopenia (for catheter-based approach only).
   o Extensive skin defects (for cooling vest approach only)
   o Diagnosis of sepsis syndrome

Procedure

All patients with refractory fever will be identified and a bladder temperature probe will be placed. Target temperature for normothermia will be 37.0 ± 0.5°C (97.7-99.5°F). Ventilator warming device temperatures will be maintained at ≤ 37°C. Tylenol will be administered 650 mg q4h for 72 hours.

Surveillance cultures from blood, urine, sputum, stool, and CSF (if applicable) will be sent if a significant rise in the WBC count is detected during the period of induced normothermia. A rise in the WBC count by ≥ 20% from the time of initiation of induced normothermia is considered significant. As part of routine care in the NeuroICU, additional cultures will be sent every 72 hours if an infectious source is suspected but not identified. The need for additional cultures prior to 72 hours is left to the discretion of the treating intensivist.

Normothermia will be maintained continuously for a period of 72 hours with either a catheter-based system or surface cooling vest, at which time the need for ongoing temperature control will be reassessed. Should the patient subsequently develop a refractory fever over the next 24 hours, re-induction of normothermia will be considered and left to the discretion of the attending neurointensivist. Shivering may be encountered while maintaining normothermia. The treatment should include the use of meperidine boluses and/or oral buspirone in patients in whom a mild degree of sedation is considered acceptable.

Shivering

Shivering may be encountered while maintaining normothermia, and can significantly reduce the efficacy of the cooling device. The treatment should include:

No Shivering:

- Standing acetaminophen

Shivering < 5 min:
- Forced air convection warmer (Bair Hugger)
- Meperidine intermittent IV push 12.5-50 mg up to 3-4 times daily. Not to be used in patients with documented renal insufficiency (serum creatinine ≥ 1.5). Contraindicated with the concomitant use of monoamine oxidase inhibitors MAOI within the past 2 weeks.
- Buspirone 5 mg ORALLY 2-3 times a day OR 7.5 mg ORALLY twice a day; may increase the dosage by 5 mg/day every 2-3 days as needed (usual dose 20-30 mg/day 2-3 divided doses, MAX dose 60 mg/day)

Shivering for > 5 min:

- When above interventions have not worked, then convert to meperidine infusion 25-50 mg/hr, or propofol 10-300 mg/hr.

Breakthrough Shivering:

- Consider infusion of dexmedetomidine 1 mcg/kg over 10 min*. Maintenance infusion dose range is 0.2-0.7 mcg/kg/hr.
- If dexmedetomidine is ineffective or unavailable, consider magnesium sulfate drip 1 g/hr for goal Mg level of 3-4.5 mmol/L, or dantrolene*.

Refractory Shivering:

- Cisatricurium or vecuronium (please refer to hypothermia after cardiac arrest guideline for dosing)

*May be used only with pharmacy approval in specific units. Please contact the Neuro ICU staff regarding its use in specific instances (726-8071).

**Authoring Information**

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