Normothermia protocol for neurological injury patients in the TWH MS/NICU
Introduction: QI Project

- **GOALS** - Standardize Tx
  - Create a resource

- **PROJECT OUTLINE**
  - Surveys
  - Protocol Development
  - Dissemination
Survey Results

Concensus on need to Tx fevers

Does a temperature of 38.3°C require treatment

- Yes, 52
- No, 18
Survey Results

- Identified need to clarify management strategies

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Are fevers in neuro patients appropriately managed in the TWH MS/NICU

- yes, 46
- no, 22
Survey Results

Agreed value of a normothermia protocol

Do you think a protocol would be helpful?

- yes, 64
- no, 5
Survey Results

Actions to manage fever

- Tylenol/ Cooling blankets/ Coolgaurd
Survey Results

- Negative outcomes
  - ↑ ICP, ↓ LOC
  - ↑ Cerebral metabolism
  - ? Seizures ?

Negative outcomes that may result from a fever

- Increased ICP: 34
- Decreased level of consciousness: 30
- Seizures: 19
- Neurological damage: 11
- Increased cerebral metabolism: 11
- Sepsis or infection: 11
Neuro patient in ICU

Fever Temp $\geq 38.0^\circ C$

Fever Management Protocol

GOAL: NORMOTHERMIA
Temp 36.0 - 37.5$^\circ C$
Therapeutic normothermia is neuroprotective and reduces the burden of cerebral metabolic distress and crisis.
Fever

- Defined as $T > 38.3^\circ C$
- Normal host response
- **Central fever:** Dysfunction of the thermoregulatory control mechanisms of the brain
- Direct physical damage to the hypothalamus (TBI), or from toxic effects of adjacent blood and direct compression of the hypothalamus (pts with edema, hemorrhagic stroke, vasospasm, IVH and ICH).
- Fever burden is greater, and onset is earlier when fever is caused by acute neurologic injury
Fever injury

- Fever independently worsens neurologic outcome
- Fever exacerbates neuronal injury, increases intracranial pressure and cerebral oxygen requirements
- Every 1 °C increase in temp = 8% increase cerebral metabolic rate
- Fever heightens the inflammatory response causing cerebral edema, ischemia, delayed vasospasm and neuronal death
**FEVER MANAGEMENT PROTOCOL**

**Goal for NORMOTHERMIA**
Temperature 36.0 - 37.5°C

1. **Complete**: Patient Assessment

2. **Consider C&S**: Blood, sputum, CSF, urine/ stool, wounds

3. **Assess WBC** trends

4. **Consider other sources of fever**: Blood transfusion reaction, Drug related or alcohol withdrawal fever, Malignant hyperthermia, Neurogenic/ Central Fever

**Persistent/ Refractory fever?**
Consider/ discuss with MD:
- a.) Continuous core temperature monitoring
- b.) Cooled IV fluids
- c.) Coolguard®/ Esophageal cooling catheter
- d.) RT to turn off heater on ventilator humidifier

**Monitor for Shivering**
Notify MD if ANY visible muscular activity noted

**Consider/ discuss possible Shivering management:**
- Propofol® infusion as ordered
- Demerol® 50mg IV Q4H PRN
- Paralytics

**Temperature**
38.0 – 38.5 °C

Give Acetaminophen (Tylenol®)
325-650mg PO/NG q4h PRN

Check Temp in 2hrs ≥ 38.0°C?
- Yes
- No

- Ice packs to groin + axillae/
- Cooling Blanket/
- Cover skin with wet towels/
- Contact Medical Engineering to lower room temperature

**Temperature**
greater than 38.5°C

Give Acetaminophen (Tylenol®)
325-650mg PO/NG q4h PRN

**Goal Temperature 36.0 - 37.5°C**
Reassess temperature in 2 hours

**If NORMOTHERMIA is NOT achieved:**
1. Continue with Tylenol® to max 4 grams in 24hrs
2. Continue with external cooling methods

**Consider/ discuss possible Shivering management:**
- Propofol® infusion as ordered
- Demerol® 50mg IV Q4H PRN
- Paralytics
Treating fevers

- Acetaminophen (Tylenol®) 325-650mg PO/NG q4h PRN
- Followed by external cooling
- Intravascular cooling catheters
- History and physical assessment followed by blood work and other diagnostic tests
Monitor for Shivering

- Benefits are offset by the adverse effects of shivering
- Change in patient’s LOC, increase metabolic stress and increase cardiovascular demand
- Decrease brain tissue oxygenation
- Cooling blankets & skin breakdown

<table>
<thead>
<tr>
<th>Grades</th>
<th>Muscle group involved</th>
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</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>No shivering observed</td>
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<tr>
<td>Grade 1</td>
<td>One or more of piloerection; peripheral cyanosis without other cause, but without visible muscular activity</td>
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<tr>
<td>Grade 2</td>
<td>Visible muscle activity confined to one muscle group</td>
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<tr>
<td>Grade 3</td>
<td>Visible muscle activity in more than one muscle groups</td>
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<tr>
<td>Grade 4</td>
<td>Gross muscular activity involving the entire body</td>
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</tbody>
</table>
Conclusions & Discussion

- Goals achieved
  - Normothermia Protocol
  - Educational activities

- Future directions
  - Educational activities
  - Nursing orientation

- Discussion
References


McIlvoy, L. (2012). Fever management in patients with brain injury. AACN Advanced Critical Care, 23(2), 204-211.


