How Low Do You Go?  
Cardiac Hypothermia Following Cardiac Arrest

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**PICOT Question**

In adults surviving out-of-hospital cardiac arrest (P) how does the use of hypothermia treatment (32°C-34°C) (I) compared to normothermia treatment (38°C) (C) influence mortality rates (O) at 180 days (T)?

**Case Study**

A 56 year old male arrives to the Emergency Department (ED) post cardiac arrest with return of spontaneous circulation (ROSC) and a Glasgow Coma Scale (GCS) of 4. His temperature is 37.5°C. Electrocardiogram (ECG) shows normal sinus rhythm and he is transferred to the Intensive Care Unit (ICU) for initiation of targeted temperature management (TTM) therapy.

**Background & Significance**

- In the United States in 2016 there were more than 350,000 out-of-hospital cardiac arrests (AHA, 2017).
- Severe neurological damage is a main cause of death in patients following out-of-hospital cardiac arrest (Rittenberg & Callaway, 2016).
- Following the American Heart Association’s (AHA) 2010 guidelines, protocols were developed for therapeutic hypothermia (32°C-34°C) to aid in neurological protection (Polderman & Varon, 2015).
- Based on new studies revealing no difference in neurological outcomes or mortality rates tested at 32°C and 36°C, the AHA has widened the temperature window from 32°C to 36°C (Nielsen et al, 2013).
- More complications can occur with therapeutic hypothermia including shivering, increased use of narcotics, and neuromuscular blockers than with normothermia (39°C) (Casamento et al, 2016).
- The goal is to prevent fever in order to improve neurologic outcome and mortality (AHA, 2015).

**Practice Guideline Key Points**

- Comatose patients with ROSC post cardiac arrest should be treated with TTM.
- Maintain temperature between 32°C and 36°C while on TTM.
- Maintain target temperature for 24 hours.
- AHA does not recommend prehospital cooling measures.
- Prevention of hyperthermia after TTM phase.

**Practice Guideline Summary**

- Practice guideline is current as of 2015.
- No conflicting information found, no other guidelines.
- Main recommendations with strong level of evidence.

**Theoretical Framework**

- Betty Neuman’s System Theory
  - Patient is described as an open system that responds to external and internal stimuli.
  - Cardiac arrest is a stressor to the system.
  - Implication to nursing is to assist system in maintaining proper functioning.
  - Nurse Practitioner (NP) will choose an appropriate temperature (32°C to 36°C) based on individual variations.

**Evidence Table**

<table>
<thead>
<tr>
<th>Author &amp; Year</th>
<th>Level of Evidence &amp; Participant</th>
<th>Variables/Statistical Test &amp; Value</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Sorenson, T., Fly, D., &amp; Participant (2012)</td>
<td>Meta-analysis 1099 participants from 6 controlled trials</td>
<td>Hypothermia vs normothermia affects survival outcome</td>
<td>Survival rate at hospital discharge (P = 0.06, odds ratio: 1.15; 95% CI: 0.89 - 1.49) Long-term survival (P = 0.36, odds ratio: 1.31; 95% CI: 0.75 - 2.26; n = 1292)</td>
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<tr>
<td>(Nielsen et. al, 2013)</td>
<td>Retrospective analysis 8516 patients with completed data</td>
<td>Induced hypothermia vs no hypothermia affects survival outcome</td>
<td>Survival rate of 0.90 95% CI: 0.65 - 1.23 P-value: 0.49 Outcomes comparison of overcool and normothermia treatment (36°C) (C) influence mortality rates (O) at 180 days (T). There was no association of induced hypothermia that improved or worsened survival rate.</td>
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**Gaps in Research & Practice**

- Range in temperature causes unclear ideal temperature target (AGREE, 2001).
- Lack of specific methods to reach temperature goals (AHA, 2017).
- No specified cost to facilities to adhere to guidelines (AHA, 2017).

**Advanced Practice Nurse Implications**

- The NP should initiate TTM for the comatose patients with ROSC post cardiac arrest with TTM (Quality) (AHA, 2017).
- NP will choose an appropriate temperature (32°C to 36°C) based on individual patient and maintain that temperature for 24 hours. (Independent Practice) (Nielsen et. al, 2013).
- NP utilizes current data and research to guide decision making to improve patient outcomes (Scientific Foundation) (Bhattacharjee, Baidya & Maitra, 2016).

**Summary**

- Research indicated there is no correlation (P=0.58; P=0.49) with improving mortality rates or neurological outcomes with hypothermia versus normothermia treatment (Bhattacharjee, Baidya & Maitra, 2016; Nichol et al, 2012).
- Based on updated guidelines in 2015, recommended treatment for post cardiac arrest patients with ROSC are to be treated with TTM between 32°C to 36°C (AHA, 2017).

**References**