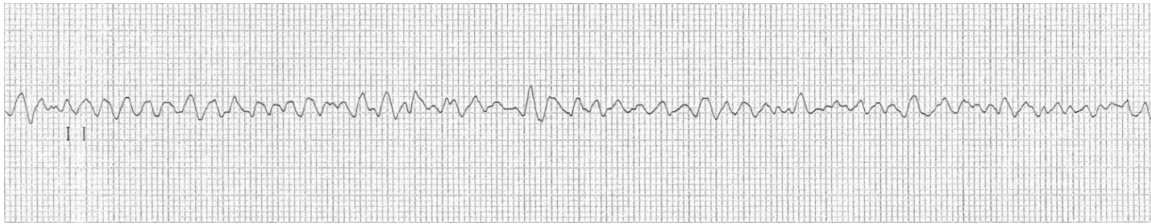


“Therapeutic Hypothermia: To cool or not to cool?”

Scenario/Introduction:

A 57-year-old male presents in cardiac arrest. You see the following rhythm on the cardiac monitor:



High quality CPR is in progress and the patient has return of spontaneous circulation after 2 rounds of epinephrine and 1 shock. Nursing staff asks you, "Doc, should we initiate code cool?" What do you tell them?

At this journal club, we held a debate considering the pros and cons of therapeutic hypothermia.

Discussion Articles:

1. Hypothermia after Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *N Engl J Med.* 2002 Feb 21;346(8):549-56. Erratum in: *N Engl J Med* 2002 May 30;346(22):1756. PubMed PMID: 11856793.
2. Moler, FW, et al, Therapeutic hypothermia after out-of- hospital cardiac arrest in children. *N Engl J Med.* 2015 May 14;372(20):1898-908. doi: 10.1056/NEJMoa1411480. Epub 2015 Apr 25. PubMed PMID: 25913022; PubMed Central PMCID: PMC4470472.
3. Arrich J, Holzer M, Havel C, Müllner M, Herkner H. Hypothermia for neuroprotection in adults after cardiopulmonary resuscitation. *Cochrane Database Syst Rev.* 2016 Feb 15;2:CD004128. [Epub ahead of print] Review. PubMed PMID: 26878327.

Discussion Articles Summary Points:

1. The Hypothermia After Cardiac Arrest Study Group was one of the landmark articles from 2002, which demonstrated favorable neurologic outcomes and decreased mortality of patients cooled to 32-34 degrees celcius after VF/VT cardiac arrest. This was a multicenter randomized controlled study of 136 patients. Seventy-five of the 136 patients (55%) had a favorable neurologic outcome as compared with 54/137 (39%) in the normothermia group. Mortality at

6 months was 41% in the hypothermia group as compared with 55% in the normothermia group.

2. The 2015 NEJM article evaluating therapeutic hypothermia after cardiac arrest in pediatric patients was a randomized study including 260 children divided into two groups: hypothermia (33 degrees Celsius) and normothermia (36.8 degrees Celsius). The researchers found no significant benefit in survival with good functional outcome at 1 year.

3. The 2012 Cochrane review concluded that mild hypothermia likely improves survival and neurologic outcome after cardiac arrest. This was a limited meta analysis given the limited number of articles available for review.

Debate Points:

Pro:

-Bernard and HACA studies (2002) demonstrate a survival and neurologic benefit with therapeutic hypothermia

-The HACA Group found an absolute risk reduction for unfavorable neurological outcome of 24% and number needed to treat of 4.

-The original articles recommending hypothermia focused on patients who had pulseless VT/VF whereas the Nielson and Moler articles included non-shockable rhythms. There has been significant indication creep.

-Hypothermia may lead to shorter ICU stays. Cooling allows for a natural timeframe to perform neurologic assessment with determination to withdraw care after giving them best shot at survival versus patients who are not cooled and may linger in the ICU much longer.

-Of all critical care interventions, TTM is inexpensive and relatively noninvasive.

Con:

-There are multiple adverse effects of hypothermia including arrhythmias, infection, coagulopathy, sepsis, electrolyte and metabolic disturbances, decreased cardiac output

-This is a resource drain. Their ICU stays will be longer as they need to wait an additional few days before making definitive neurologic assessment.

-May not be suitable in many practice environments.

-AHA 2015 guidelines: there is insufficient evidence to recommend the use of therapeutic hypothermia in kids.

-There are too many unclear variables: timing of initiation of cooling, cooling technique,

rate/depth/length of cooling and rewarming

-As demonstrated by Nielsen, N, et al., TTM to a goal of 33 degrees Celsius was not associated with reduction in all cause mortality or improvement in neurologic outcomes when compared to a goal of 36 degrees Celsius.

Bottom Line:

Targeted temperature management is a controversial and evolving topic. The original HACA and Bernard studies advocating for therapeutic hypothermia following ROSC have been called into question with the 2013 TTM trial found no difference between targets of 33 and 36 degrees Celsius in terms of all-cause mortality. Rather, it questioned the role of hypothermia versus tighter control of normothermia. The current 2015 AHA recommendations allow for some variability in initiating targeted temperature management and clinicians should consider the risks and benefits in making this decision.