Cochrane for Clinicians

Putting Evidence into Practice

Hypothermia for Neuroprotection in Adults After Cardiopulmonary Resuscitation

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The Cochrane Abstract on the next page is a summary of a review from the Cochrane Library. It is accompanied by an interpretation that will help clinicians put evidence into practice. Drs. Hassani and Meyer present a clinical scenario and question based on the Cochrane Abstract, followed by an evidence-based answer and a critique of the review. The practice recommendations in this activity are available at http://www.cochrane.org/reviews/en/ab004128.html.

EB CME

This clinical content conforms to AAFP criteria for evidence-based continuing medical education (EB CME). See CME Quiz on page 469.

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A collection of Cochrane for Clinicians published in *AFP* is available at http://www.aafp.org/afp/cochrane.

Clinical Scenario

A 64-year-old man presents to the emergency department with shortness of breath. While there, he has a witnessed ventricular fibrillation that requires five minutes of cardiopulmonary resuscitation. A family member asks what steps can be taken to improve the patient's outcome.

Clinical Question

Does therapeutic hypothermia help improve neurologic outcomes after cardiopulmonary resuscitation?

Evidence-Based Answer

Compared with standard care, therapeutic hypothermia with conventional cooling methods improves the rate of survival to hospital discharge and neurologic outcome in patients successfully resuscitated after cardiac arrest.[1] (Strength of Recommendation = A, based on consistent, good-quality patient-oriented evidence)

Practice Pointers

Therapeutic hypothermia is a new process for preservation of cerebral function after cardiopulmonary resuscitation. Within six hours of cardiac arrest, lowering body temperature to about 91.4°F (33°C) and continuing to cool the body for 12 to 24 hours after cardiac arrest can inhibit glutamine and dopamine neurotransmitters, which otherwise lead to tissue damage.[1] In theory, this should help preserve the blood-brain barrier, protect adenosine triphosphate stores, and decrease intracranial pressure, ultimately reducing cell death in various brain regions.[2]

The five studies included in this Cochrane review each used different cooling methods.[1] Three of the five studies utilized conventional cooling methods, such as ice packs, cooling pads, water immersion, and cold fluids. These studies and a study that did not specify the cooling method showed a benefit to survival and improved neurologic outcomes with cooling. Although some patients experienced adverse events (including long lasting arrhythmias, sepsis, or bleeding), none of the complications were significantly more common in the group who underwent cooling when compared with control group outcomes.[1] One study used hemofiltration; in the hemofiltration group, there were no significant differences in patients' neurologic outcomes or survival to discharge compared with placebo.

On average, 14 to 40 percent of patients who have cardiac arrest achieve spontaneous circulation upon resuscitation.[3] Of these, only 7 to 30 percent have good neurologic outcome upon hospital discharge.[4] Based on these survival metrics, a small population of patients annually meet the criteria for therapeutic hypothermia in hospitals. This can create logistical challenges in implementing a prompt protocol. However, effective cooling methods are inexpensive and readily available.

Efforts should be made to increase awareness of therapeutic hypothermia benefits. There was a 12 percent increase in good neurologic outcomes and a 15 percent increase in survival to discharge in patients who received therapeutic hypothermia compared with those in the control group.[1,4] Patients receiving therapeutic hypothermia are more likely to return to normal life with only minor deficits.

Cochrane Abstract

Background: Good neurologic outcome after cardiac arrest is hard to achieve. Interventions during the resuscitation phase and treatment within the first hours after the event are critical. Experimental evidence suggests that therapeutic hypothermia is beneficial, and a number of clinical studies on this subject have been published.

Objectives: The authors performed a systematic review and meta-analysis to assess the effectiveness of therapeutic hypothermia in patients after cardiac arrest. Neurologic outcomes, survival, and adverse events were the main outcome parameters. The authors performed individual patient data analysis when data were available, and from subgroups according to the cardiac arrest situation.

Search Strategy: The authors searched the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL; *The Cochrane Library,* 2007 Issue 1); Medline (1971 to January 2007); EMBASE (1987 to January 2007); CINAHL (1988 to January 2007); PASCAL (2000 to January 2007); and BIOSIS (1989 to January 2007).

Selection Criteria: The authors included all randomized controlled trials assessing the effectiveness of therapeutic hypothermia in patients after cardiac arrest without language restrictions. Studies were restricted to adult populations treated with any cooling method applied within six hours of cardiac arrest.

Data Collection and Analysis: Validity measures, the intervention, outcome parameters, and additional baseline variables were entered into the database. Meta-analysis was only done for a subset of comparable studies with negligible heterogeneity. For these studies, individual patient data were available.

Main Results: Four trials and one abstract reporting on 481 patients were included in the systematic review. Quality of the included studies was good in three out of five included studies. For the three comparable studies on conventional cooling methods, all authors provided individual patient data. With conventional cooling methods, patients in the hypothermia group were more likely to reach a best cerebral performance categories score of 1 or 2 (5-point scale: 1 = good cerebral performance, 5 = brain death) during hospital stay (individual patient data; relative risk [RR] = 1.55; 95% confidence interval [CI], 1.22 to 1.96) and were more likely to survive to hospital discharge (individual patient data; RR = 1.35; 95% CI, 1.10 to 1.65) compared with standard post-resuscitation care. Across all studies, there was no significant difference in reported adverse events between hypothermia and control groups.

Authors' Conclusions: Conventional cooling methods to induce mild therapeutic hypothermia seem to improve survival and neurologic outcomes after cardiac arrest. The authors' review supports the current best medical practice recommended by the International Resuscitation Guidelines.

According to guidelines from the International Liaison Committee on Resuscitation, therapeutic hypothermia should be tried in unconscious adult patients with spontaneous circulation if they had an out-of-hospital cardiac arrest from ventricular fibrillation.[5] It can also be considered in patients with any cardiac arrest.[5]

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Author disclosure: Nothing to disclose.

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