



Medical Direction and Practices Board

WHITE PAPER

Post Resuscitation Care – Therapeutic Hypothermia

Post Resuscitation Care is a new protocol for the Maine 2013 protocols. The protocol encompasses several important treatment points:

1. Managing the airway and keeping the O₂ sat greater or equal to 94% while at the same time being cognizant to prevent excessive ventilations and hyperoxia.
2. Promptly identifying ST elevation MI on the post-resuscitation EKG and transporting patients to the most appropriate facility that is capable of maintaining/initiating therapeutic hypothermia as well as treating STEMI based on local/regional guidelines.
3. Aggressive management of hypotension using Normal Saline (NS) boluses. If the patient requires more than 2000 ml NS to maintain a systolic BP of 90, then the new pressor, NOREPINEphrine, is recommended.
4. Consideration of initiating Therapeutic Hypothermia in patients who have Return of Spontaneous Circulation (ROSC) and remain comatose with the goal of cooling the patient to 34° Celsius (C) using a combination of cold packs to the groin, axilla, and neck as well as administering a 30 ml/kg bolus of 4° C NS.

OVERVIEW

With increasing numbers of patients being resuscitated and admitted to the hospital, the opportunity for improving neurologically favorable long-term survival has focused increased attention on post-resuscitation care.

CARDIAC ARREST

A cardiac arrest by definition is when the heart stops beating, the person stops breathing and the brain suffers anoxic injury due to a lack of blood flow. It's estimated that there are over one million cardiac arrest events in North America and Europe per year. Cardiac arrest is a potentially salvageable condition, it may be possible to restore blood flow and achieve return of spontaneous circulation (ROSC) through medical intervention.

Medical studies have shown that it is possible to reactivate the heart in 20-50% of cases. Sadly, those patients who have originally been revived still die due to various complications. Actual survival rates to discharge from hospital are much lower and reflect the initial period of insult to the body from cardiac arrest. When cardiac arrest has taken place outside a hospital, the survival rates vary from 1-15%. The sooner that resuscitation is started and a person has return of spontaneous circulation the greater the chance of survival.

POST-RESUSCITATION

Significant damage takes place to the vital organs of the body, in particular the brain, such that many patients eventually die from these injuries. It is estimated that one third of cases die from brain and neurological damage, one third die from heart and myocardial damage and another third die from the various inflammatory processes.

PATHOPHYSIOLOGY

During cardiac arrest, with no or low flow of blood, patients suffer from relative or absolute ischemia (or lack of oxygen). In the brain, research has shown that oxygen levels stored within the cells are rapidly depleted within about 2 minutes and at the same time there is a rapid depletion of energy stores (ATP) leading to an accumulation of toxic materials that can no longer be cleared from cells. These include lactate and acid. There is then massive cell damage and ultimately cell death as a consequence of these processes.

Even if ROSC occurs with resultant restoration of blood flow to the brain, there remains danger of further damaging the CNS tissue. This is called reperfusion injury and mainly takes place due to high levels of oxygen free radicals, which are a toxic form of oxygen that can cause cell injury and death.

CURRENT TREATMENT

Current guidelines strongly recommend that people who have recovered from a cardiac arrest should be cooled to approximately 34° C, which limits brain cell activity during the first 24 hours after recovery and hence limits the injury that is caused by reperfusion of the brain. It is also strongly recommended that complications that arise as a consequence of a cardiac arrest such as seizures or fevers as well as blood and glucose control should be optimized so as to limit the metabolism of brain cells and thus limit the amount of damage that takes place. New research is now focusing on attempts to try and cool the brain during the period of cardiac arrest (as opposed to after recovery from a cardiac arrest which is being carried out in most medical centers at this time) in which most of the damage is taking place so that patients who recover and whose heartbeat is restored, will end up with less brain cell damage in the future. Studies show a 40-45% full neurological survival rate for patients with ROSC who are rapidly cooled compared to 10-15% survival in those who are not. The most important factor in achieving these survival rates is rapidly cooling patients after ROSC and preventing patients from rewarming for 24 hours.

This protocol asks services to consider initiation of therapeutic hypothermia. Services choosing to do so should work closely with their partner hospitals to create a system of care that best coordinates the overall care of these patients.

The 4° C Normal Saline may be infused IV or IO. If the IO rate is chosen, studies recommend humeral IO if possible due to better flow rates.

Paramedic services will need to consider the best way to keep 4° C Normal Saline on their rigs. One option, if a refrigerator on the ambulance is not available, is to keep 2 liters cooled NS in a refrigerator at base, then place it in a cooler before leaving on a response. Standard coolers such as “Igloo” have been shown to maintain NS or other fluids at 4° C with ice packs included, for 12-16 hours. LifeFlight of Maine has confirmed similar data and now utilize this strategy for both blood and NS. If coolers are not feasible, cold packs to the axilla, groin, and neck can still be done in addition to keeping the inside of the ambulance as cold as possible.

Other significant recommendations include insuring that a patient’s blood pressure and breathing patterns are optimally managed. Current hospital guidelines are variable, however, in many cases patients are being evaluated for cardiac catheterization to assess for coronary disease as many studies have shown that up to 80% of patients suffering from cardiac arrest have an underlying blockage of one of the blood vessels in the heart.

Post resuscitation care is a very exciting development within the field of cardiac arrest, since one of the optimal goals for any medical provider taking care of patients suffering cardiac arrest is to ensure as little brain damage and damage to other major organs as possible.

As a Maine EMS provider, you can make a significant difference with this very important protocol.

A PowerPoint presentation on Therapeutic Hypothermia is available upon request.

REFERENCES

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