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Controlled cooling helps save brain function

Protocol Makes Hypothermia a Medical Ally

Critical Care Medicine chief Moss says cooling protocol can help stave off neurological damage in cardiac arrest patients.

"Hypothermia protects the brain and therefore gives patients a better chance of recovery."

It's rare to think of hypothermia, with its images of frostbitten flesh, uncontrollable shivering and mental confusion, as a good thing. But a protocol in place at University of Colorado Hospital uses low body temperature to slow down the potentially devastating neurological and cognitive damage caused by cardiac arrest.

The idea behind the approach, called therapeutic hypothermia, is relatively straightforward. Patients who suffer cardiac arrest may stop breathing for periods of time. Oxygen-starved brain cells die, heightening the risk of permanent damage to the brain and the rest of the nervous system.

Lowering body temperature through a controlled process puts the brakes on the destruction. Studies have shown the cooling can inhibit the release of hormones and neurotransmitters that lead to tissue damage, decrease cranial pressure and reduce cell death in the brain.

Saving brain. "Hypothermia protects the brain and therefore gives patients a better chance of recovery," says Marc Moss, MD, head of the Critical Care Medicine section at the University of Colorado School of Medicine.

Hospital providers used the approach last month to treat a patient who suffered cardiac arrest in the Anschutz Outpatient Pavilion. The 29-year-old woman was revived with cardiopulmonary resuscitation and rushed to UCH's Emergency Department (ED). She received therapeutic hypothermia in the Medical Intensive Care Unit (MICU) to prevent neurologic damage and left the hospital under her own power two weeks later (*Insider*, May 26).

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CICU nurse Karen Lovett shows spaces in leg wraps that fill with cooled water and lower a patient's body temperature.

"The patient had full neurologic function," says Karen Lovett, RN, of the Cardiac Intensive Care Unit (CICU).

Therapeutic hypothermia has been used at UCH for five-plus years, Lovett says. It's administered to unresponsive cardiac arrest victims who have a return of "spontaneous circulation," or detectable pulse and blood pressure.

"It's the best opportunity to preserve neurological function and provide patients with the opportunity to return to a normal life."

Machine controls water temperature.

Careful administration. It's nearly always administered in the CICU and MICU, she notes, although providers in the ED sometimes start it before transferring the patient to intensive care. Nurses trained to use the equipment follow a protocol and policies and procedures the hospital adopted in 2008, along with patient care order sets *(see sidebar)*.

Providers wrap the patient's chest and legs, from ankle to thigh, in lightweight plastic "blankets" studded with dozens of tiny spaces similar to the baffles in a waterbed. Tubing runs from the blankets to a temperature-controlled machine that fills the spaces with water set at precisely 33.5 degrees Celsius (about 92 degrees Fahrenheit, or nearly 7 degrees lower than a person's normal body temperature).

After the patient's body temperature falls to that level – a period of one or two hours, Lovett says – providers maintain it for 24 hours, allowing the nervous system to heal, before they begin a slow 12-hour warm-up back to normal body temperature.

Wrap at the top of the photo goes around the patient's chest, while the lower wraps encircle the legs from thigh to ankle.

Continued

"It's the best opportunity to preserve neurological function and provide patients with the opportunity to return to a normal life," says Lovett. Before the treatment, she adds, providers could do little for patients but deliver cardiac care and allow them to proceed on their own neurologically.

Regular monitoring required. Administering therapeutic hypothermia is hardly a matter of set the machine and forget it, Lovett emphasizes. Patients are heavily medicated with sedatives and sometimes paralytics to prevent shivering – which is the body's way of trying to stay warm – while the wraps cool them down, Lovett says. "They don't remember the experience when they awaken."

It requires one-on-one care from MICU and CICU nurses trained to operate the equipment, review order sets, follow the treatment protocol and watch for side effects, which include low heart rate and blood pressure, irregular heartbeat, unsafe shifts in fluids and electrolytes, bleeding problems and skin breakdowns caused by the blankets.

Patients also receive frequent neurological assessments during the 24-hour cooling period and careful monitoring during the subsequent 12-hour warm-up, Lovett says.

The benefits of therapeutic hypothermia, however, easily outweigh the risks, Moss says. "Often these patients are critically ill and require various forms of life support," he notes. "Hypothermia improves the chances that patients will be able to think and evaluate and process information after a neuro-catastrophe."

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UCH Protocol Helps Keep Therapeutic Hypothermia a Proven Success

Hospitals have used therapeutic hypothermia to treat cardiac arrest patients since the *New England Journal of Medicine* published a study in 2002 that demonstrated its efficacy. It's now included in the International Resuscitation Guidelines established by the American Heart Association.

Nurses receive training to ensure they are competent to administer the treatment and follow a protocol and policies and procedures.

A review of studies of the technique by the non-profit Cochrane Collaboration® concluded, "…patients were more likely to leave the hospital without major brain damage and they were more likely to survive to hospital discharge."

The treatment is widely used by hospitals throughout Colorado, Critical Care Medicine's Marc Moss, MD, says, and "should be standard. It's not hard to invoke with proper nursing care. It's low risk and helps to improve outcomes."

Indeed, the Cochrane report found "no cooling specific adverse events" reported by the researchers who conducted the studies, which included a total of 481 patients.

Updates? Therapeutic hypothermia is administered an average of four times a month at UCH, nearly always in the MICU and CICU, says Karen Lovett, RN, of the CICU.

Nurses receive training to administer the treatment, follow a protocol and hew to the policies and procedures Lovett helped to revise in 2008 as part of a collaborative group representing Cardiology, the ED, RNs, clinical nurse specialists and Pharmacy.

Lovett says she is reviewing the medical literature again to make any needed updates to the protocol and clinical procedures.

The hospital also uses pre-printed patient care order sheets for easier and more accurate documentation of treatment times, medication and IV orders, needed labs and other tests, target parameters, such as blood pressure and body temperature, and more. The sheets also provide treatment directions and clinical signs indicating an attending physician must be notified.

"Neurology is consulted early in the protocol and again if needed during the re-warming phase," Lovett adds, "for consultation and follow-up."

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