



# An established extracorporeal membrane oxygenation protocol promotes survival in extreme hypothermia

Eric R. Scaife\*, R.C. Connors, S.E. Morris, P.F. Nichol, R.E. Black,  
M.E. Matlak, K. Hansen, R.G. Bolte

IRB 0020292, University of Utah Institutional Review Board, Salt Lake City, UT 84113-1103, USA

Received 6 August 2007; accepted 8 August 2007

## Index words:

Hypothermia;  
Extracorporeal membrane  
oxygenation (ECMO);  
Pediatric;  
Protocol;  
Cardiopulmonary arrest

## Abstract

**Background:** Historical reports indicate that active rewarming with extracorporeal membrane oxygenation (ECMO) can salvage a patient after hypothermic cardiac arrest. We created a protocol that includes ECMO for extreme hypothermia to guide rewarming of the hypothermic patient.

**Methods:** A retrospective review of the ECMO rewarming protocol (2004-2006) was conducted.

**Results:** The active rewarming protocol is a flowchart that is available on our hospital intranet and can be accessed in the trauma bay. A severely hypothermic patient triggers the activation of a TRAUMA ONE-OP ECMO response. During the 2-year period, there were 5 activations of the system and 4 children were placed on ECMO. Two of the 4 were dramatically salvaged and eventually discharged neurologically intact. All 5 children were found pulseless at the scene before transport. The average time from the injury occurrence to arrival was 94 minutes (range, 41-181 minutes). Mean cardiopulmonary resuscitation time was 78.2 minutes (range, 37-152 minutes). The mean core temperature on arrival was 25.4°C (range, 20.4°C-28.6°C). The average time from arrival to ECMO cannulation was 25.5 minutes (range, 16-37 minutes).

**Conclusion:** A preemptive strategy for the severely hypothermic patient provides an organized approach and prompt response. Expedient rewarming can make the difference in an opportunity for survival.

© 2007 Elsevier Inc. All rights reserved.

In 1986 a 2-year-old girl drowned and was saved with extracorporeal rewarming at our children's hospital [1]. Extracorporeal membrane oxygenation (ECMO) was abandoned by our institution in the 1990s and reinstated in July of 2000. Shortly after ECMO again became available the trauma team was asked to rewarm a hypothermic patient with

the hopes of reproducing the result seen in 1986. The effort was chaotic and the outcome was poor. This experience provoked our trauma team to develop a protocol to guide the use of ECMO in the hypothermic patient.

A carefully drafted protocol would help to guide efficient care to a child with an emergency condition. The protocol needed to be clear in its directions and easily accessible when the uncommon event occurred. A subcommittee of our trauma service drafted a resuscitation protocol, based upon the medical literature that guided the management of profound hypothermia. This protocol was placed on the hospital's intranet so that it could be easily

Presented at the 40th annual meeting of the Pacific Association of Pediatric Surgeons, Queenstown, New Zealand, April 15-19, 2007.

\* Corresponding author. Salt Lake City, Utah 84113-1103, USA. Tel.: +1 801 662 2950.

E-mail address: [eric.scaife@hsc.utah.edu](mailto:eric.scaife@hsc.utah.edu) (E.R. Scaife).

accessed and the trauma paging system was edited to include a “TRAUMA ONE-ECMO” page. Activation of the hypothermia protocol would bring the ECMO circuit and the perfusionist to the trauma bay in anticipation of potential cannulation, in addition to our standard trauma team response.

The protocol, shown in Fig. 1, was implemented in 2004. From 2004 to 2006, there were 5 activations of the rewarming protocol and 4 of those children were placed on ECMO for active rewarming. We present our experience with a preemptive strategy for extreme hypothermic cardiac arrest.

### 1. Case—before hypothermia protocol

In the month of June, a 5-year-old boy was found submerged in a canal. The water was cold from mountain runoff but no temperature was taken. The child was extricated and individuals at the scene initiated cardiopulmonary resuscitation (CPR). His initial temperature was 28°C, his pH was less than 6.5, and his potassium level was 6.1 mmol/L. Initial attempts at rewarming included a

warming blanket and gastric lavage. A decision was made to pursue warming with ECMO and the child was placed on the circuit 78 minutes after arrival. His total CPR time was estimated to be 120 minutes. He developed an abdominal compartment syndrome shortly after cannulation and required decompressive laparotomy. The child developed cerebral edema progressing to herniation and death.

### 2. Cases—after hypothermia protocol

#### 2.1. Case 1

An 18-month-old wandered away from his family and was missing 30 to 45 minutes before being discovered in a pond. The child was in full arrest and CPR was initiated. He was intubated by paramedics and given 3 doses of epinephrine and a dose of bicarbonate. He recovered a spontaneous rhythm and was flown to the children’s hospital. A TRAUMA ONE-ECMO (T1-E) page was triggered but ECMO was not used because the child suffered a warm-water drowning. The child did not survive.

### Resuscitation of Profound Environmental Hypothermia

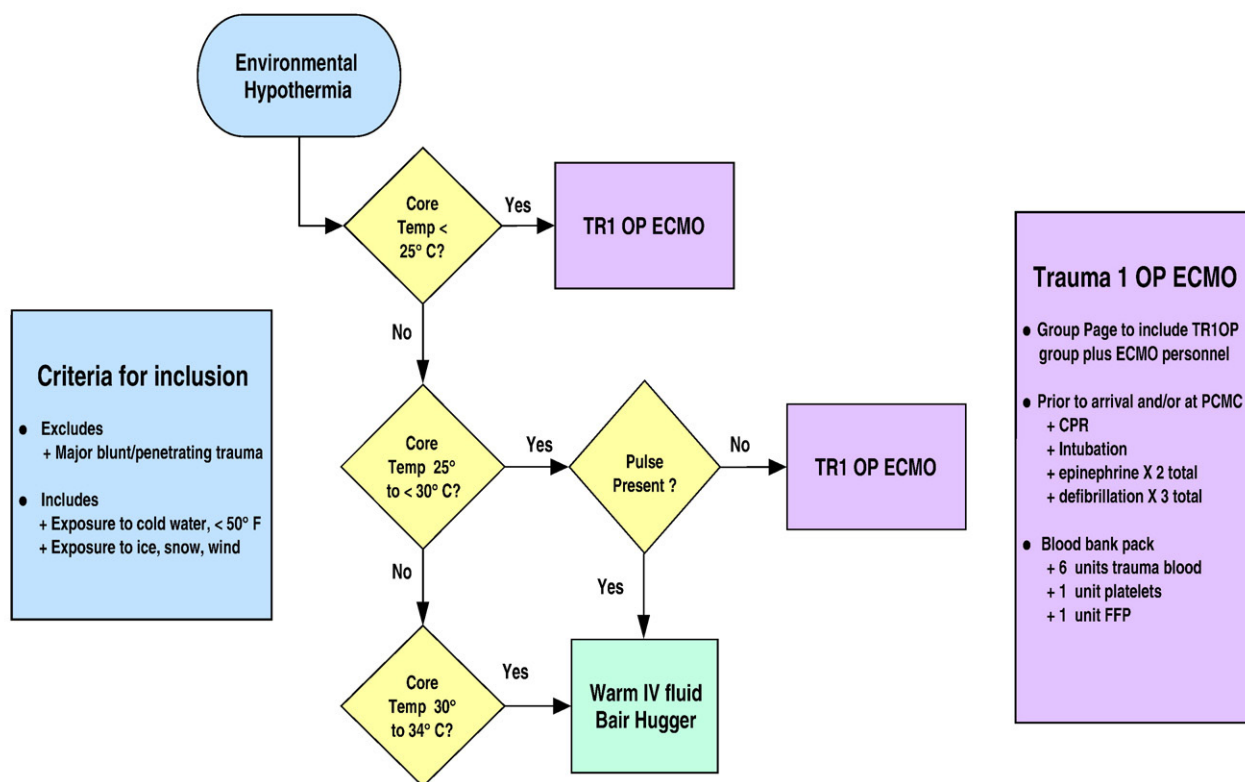


Fig. 1 The protocol for management of extreme hypothermia.

Download English Version:

<https://daneshyari.com/en/article/4159993>

Download Persian Version:

<https://daneshyari.com/article/4159993>

[Daneshyari.com](https://daneshyari.com)