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## OPEN

# About Rewarming Young Children After Drowning-Associated Hypothermia and Out-of-Hospital Cardiac Arrest

To the Editor:

We welcomed the analysis of 57 pediatric patients reported in the literature with drowning-associated hypothermia and out-of-hospital cardiac arrest (OHCA) that appeared in *Pediatric Critical Care Medicine* (1). As a group of special interest clinicians (four are members of the Medical Commission of the International Commission of Alpine Rescue, see <https://icar-med.com>), we appreciate this opportunity to raise three points with the authors.

First, we thank the authors for summarizing the cases published (1963–2023) using the CAse Report (CARE) guideline and checklist (2), and for making available the details of each case in the Supplementary Digital Content (SDC) (1). However, although we found it helpful to see the data grouped by type of support—use of extracorporeal membrane oxygenation (ECMO) or not (44 vs. 13)—we would comment on this comparison and the obvious differences between the groups. For example, deciding to use ECMO or not in OHCA cases represents two different pathways in decision-making. Just consider the fact that all 44 patients who underwent ECMO had OHCA as opposed to only 8 of the non-ECMO patients experiencing OHCA. In real time, a decision not to provide ECMO in the ECMO group would, presumably, have had an inevitable consequence.

The 2021 European Resuscitation Council (ERC) guidelines for cardiac arrest in accidental hypothermia stated that “rewarming should be performed with extracorporeal life support (ECLS), preferably with ECMO over cardiopulmonary bypass (CPB)” (3). The 2021 ERC guidance for pediatric life support in such special circumstances is that “Any child who is considered to have any chance of a favorable outcome should ideally be transported as soon as possible to a (pediatric) reference center with ECLS or CPB capacity” (4) (note in italic and underlined is our emphasis). The difference in guidance comes down to prognostication of successful rewarming. In adults, the ERC stated that such prognostication “should be” based on the Hypothermia Outcome Prediction after ECLS (HOPE) score. In children, the ERC stated the HOPE score “should not be used.... instead consider expert consultation” (3). The HOPE score uses six covariates at hospital admission (i.e., age, sex, core temperature, serum potassium, presence of asphyxia, and duration of cardiopulmonary resuscitation) (5), and there is an online calculator for estimation of survival probability (see

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<https://hypothermiascore.org>). Our second question for the authors is whether they could look at the 44 ECMO cases (using data in their SDC Table S1 [1]) and calculate the HOPE score. Perhaps the poor outcome of children with drowning-associated hypothermia and OHCA undergoing ECMO is a reflection of very low probability of survival using the HOPE score. We realize that this test does not follow the 2021 ERC guidelines for pediatrics (4), but the unique dataset that Andre et al (1) have collated using the CARE checklist may be a starting point from which the field can better delineate what exactly is meant by “...instead consider expert consultation” (3). In this context, our views remain: 1) use ECMO to resuscitate hypothermic children with OHCA and no return of spontaneous circulation (ROSC) in the field and 2) use conventional rewarming only in children who have ROSC.

Finally, we recognize that this area of practice—hypothermia and OHCA—is fraught with a paucity of good data, particularly pediatric. The authors have carried out a valuable 60-year (1963–2023) assessment of the case reports in the literature (1). We would like to highlight for readers of PCCM our internet-based International Hypothermia Registry (see <https://hypothermia-registry.org>). The number of pediatric cases is few and we welcome collaborations with centers (6).

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The authors have disclosed that they do not have any potential conflicts of interest.

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