

Available online at www.sciencedirect.com

Resuscitation Plus

journal homepage: www.elsevier.com/locate/resuscitation-plus

Letter to the Editor

Comment on the use of the HOPE score in the specific case of drowning resuscitation



Dear Editor,

We read with great interest the case reported by Seesink et al., on the successful use of extracorporeal membrane oxygenation (ECMO) in the prehospital setting for a drowning resuscitation.¹ We would like to comment on several aspects regarding the use of the HOPE (Hypothermia Outcome Prediction after extracorporeal life support (ECLS) rewarming) score in this context.

The HOPE score estimates a survival probability until hospital discharge after ECLS rewarming for hypothermic cardiac arrest (CA) according to variables available at hospital admission, to guide decisions whether to use ECLS rewarming or not.^{2–4} The authors reported a HOPE score of 5% at hospital admission, precisely 85 min after cardiopulmonary resuscitation (CPR) initiation, which lasted 15 min as the prehospital ECMO was initiated on site. Cardiac arrest cannot therefore be considered at the stage of hospital admission. The CPR duration is defined in HOPE as the time interval from initiation of external CPR until start of ECLS. Calculating HOPE with retrospective values of CPR duration and on-site core temperature certainly biased the score value at the hospital. We do not recommend using the HOPE score in this way.

In this situation, CA attributed to pure hypothermia may also be challenged. Hypothermic CA occurs at a core temperature <30 °C in healthy patients, although it has been described in elderly and multimorbid patients with a core temperature between 30 and 32 °C.^{5,6} Also, information about serum potassium is missing. The introduction of the ECMO in the prehospital setting has probably altered serum potassium values. It is unlikely that the potassium used to calculate HOPE at hospital admission corresponds to the value at water extraction or to the hypothetical value during ongoing CPR at ED arrival. By simulating the HOPE score calculation according to the available presumed parameters used in this case (age: 18 years, sex: male, hypothermia mechanism: asphyxia, CPR duration: 15 min, core temperature: 30.5 °C), we obtain survival probabilities of 14% and 2% respectively with hypothetical potassium measurements of 3.5 mmol/l and 7 mmol/l. This shows the major impact of minor biological variations on survival probability estimations.

Finally, the aim of the HOPE score is to guide difficult decision-making in critical and stressful situations. A HOPE threshold of 10% below which ECLS rewarming would not be performed has been suggested to keep the number of false negative patients low, i.e., patients who are not rewarmed although they would have sur-

vived after ECLS, while significantly reducing the number of false positive patients, i.e., patients who are not successfully rewarmed.⁷ A HOPE score of 5% might therefore have serious consequences, making it essential to calculate it as reliably as possible. When in doubt about the possibility of immersion over submersion due to the absence of bystanders, and similar to what is recommended for avalanche victims,⁸ we suggest using the best-case scenario of a hypothermia mechanism “without asphyxia” to calculate HOPE. This would provide survival probabilities of 54% and 13% respectively in the two scenarios above, thus limiting the risk of under triage.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- Seesink J, van der Wielen W, Dos Reis D, Miranda, et al. Successful prehospital ECMO in drowning resuscitation after prolonged submersion. *Resusc Plus* 2024;19:100685. ISSN 2666-204.
- Pasquier M, Hugli O, Paal P, et al. Hypothermia outcome prediction after extracorporeal life support for hypothermic cardiac arrest patients: The HOPE score. *Resuscitation* 2018;126:58–64.
- Pasquier M, Rousson V, Darocha T, et al. Hypothermia outcome prediction after extracorporeal life support for hypothermic cardiac arrest patients: an external validation of the HOPE score. *Resuscitation* 2019;139:321–8.
- Lott C, Truhlář A, Alfonzo A, et al. ERC Special Circumstances Writing Group Collaborators. European Resuscitation Council guidelines 2021: cardiac arrest in special circumstances. *Resuscitation* 2021;161:152–219.
- Frei C, Darocha T, Debaty G, et al. Clinical characteristics and outcomes of witnessed hypothermic cardiac arrest: a systematic review on rescue collapse. *Resuscitation* 2019;137:41–8.
- Paal P, Pasquier M, Darocha T, et al. Accidental hypothermia: 2021 update. *Int J Environ Res Public Health* 2022;19:501.

7. Rousson V, Hall N, Pasquier M. HOPE survival probability cutoff for ECLS rewarming in hypothermic cardiac arrest. *Resusc Plus* 2024;23:100616.
8. Pasquier M, Strapazon G, Kottmann A, et al. On-site treatment of avalanche victims: Scoping review and 2023 recommendations of the international commission for mountain emergency medicine (ICAR MedCom). *Resuscitation* 2023;184:109708.

N. Hall

Department of Emergency Medicine, Lausanne University Hospital, Lausanne, Switzerland

V. Rousson

Center for Primary Care and Public Health (Unisante), Lausanne, Switzerland

M. Pasquier*

Department of Emergency Medicine, Lausanne University Hospital and University of Lausanne, Switzerland

* Corresponding author at: Department of Emergency Medicine, Lausanne University Hospital and University of Lausanne, BH09, 1011 Lausanne, Switzerland.

E-mail addresses: mathieu.pasquier@chuv.ch.

Received 1 July 2024

Accepted 5 July 2024

<https://doi.org/10.1016/j.resplu.2024.100723>

© 2024 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).