

In-hospital cardiac arrest and extracorporeal CPR



A new analysis has identified the predictors of survival to discharge in adults resuscitated with extracorporeal cardiopulmonary resuscitation (ECPR) following in-hospital cardiac arrest (IHCA). The study findings show that, in adult IHCA treated with ECPR, a shockable initial rhythm, a lower low-flow time, lower blood lactate levels before ECPR start or on ICU admission, and a lower SOFA score or creatinine levels in the first 24 hours after ICU admission were associated with a higher likelihood of survival.

ECPR by means of emergency veno-arterial cardiopulmonary bypass can restore circulation in patients with prolonged CA in whom conventional CPR (CCPR) is unsuccessful. However, the potential benefit of ECPR should be balanced against the risk of futility, post-anoxic brain damage and additional costs so that selecting patients who will benefit most from ECPR is essential.

While predictors of favourable outcome for ECPR recipients following out-of-hospital CA (OHCA) have recently been investigated, no systematic evaluation for IHCA has been published so far, and there are no clinical guidelines for the use of ECPR in IHCA. Thus, researchers performed a systematic review and meta-analysis was to identify the factors associated with survival to hospital discharge in patients resuscitated from IHCA using ECPR. The secondary objective was to measure the rate of favourable neurological outcome at discharge, defined as Cerebral Performance Categories (CPC) 1 or 2 (i.e., neurological disability from absent to moderate) in these patients. MEDLINE and ISI Web of Science were searched for eligible studies. Pooled Odds Ratio (OR) and Pooled Mean Difference (PMD) for each predictor were calculated. The quality of evidence (QOE) was evaluated according to the GRADE guidelines.

The analysis included 11 studies totalling 856 patients. Of these, 324 (37.9%) survived to discharge. Good neurological outcome (CPC 1 or 2) occurred in 222/263 (84.4%) survivors. Survival was associated with significantly higher odds of an initial shockable rhythm (OR 1.65; 95% confidence interval [95%CI] 1.05–2.61; $p = 0.03$), shorter low-flow time (PMD -17.15 [$-20.90, -13.40$] min; $p < 0.00001$), lower lactate levels both immediately before ECPR start (PMD -4.12 [$-6.0, -2.24$] mmol/L; $p < 0.0001$) and on ICU admission (PMD -4.13 [$-6.38, -1.88$] mmol/L; $p < 0.0003$), lower SOFA score (PMD -1.71 [$-2.93, -0.50$]; $p = 0.006$) and lower creatinine levels within 24 hours after ICU admission (PMD -0.37 [$-0.54, -0.19$] mg/dl; $p < 0.00001$).

In addition, the results showed no significant association between survival and age, gender, or cardiac vs. non-cardiac aetiology. The overall QOE was low or very low.

"Low-flow time was the most consistent predictor of survival in our review, being significantly lower in survivors than in non-survivors in all studies where it was reported," the authors write. "This result is in line with studies conducted in multicentre in-hospital arrest registries in which duration of CCPR was identified as a major independent predictor of outcome."

When evaluating patients who are unresponsive to CCPR for eligibility to ECPR, using CCPR duration as the only criterion may risk delaying a timely implementation of ECPR, which suggests that earlier predictors should be considered. "Our review showed that blood lactate, which has already been identified as a significant outcome predictor when measured after ROSC [return of spontaneous circulation], predicts mortality even when measured during CCPR before ECPR is started. This finding was not reported in studies on OHCA resuscitated with ECPR and the reason is probably that measuring blood lactate in the out-of-hospital setting is technically difficult," the authors explain.

Overall survival in ECPR-treated patients included in this review was 37.9%, which is about twice the survival rate usually reported in IHCA patients treated with CCPR, the authors say. In addition, the majority of survivors had a favourable neurological outcome at hospital discharge.

The authors also say that further studies are needed to assess these factors in a robust multivariate predictive outcome model and to prospectively validate it.

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