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Post-resuscitation care: ERC–ESICM guidelines 2015

Received: 5 October 2015
Accepted: 7 October 2015
Published online: 13 October 2015
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The intensive care treatment of cardiac arrest survivors has evolved considerably over the past 10 years. In 2005 the European Resuscitation Council (ERC) Guidelines for Advanced Life Support included less than three pages of text on post-resuscitation care [1]. Since 2005, the management of post-cardiac arrest patients has achieved a much higher profile within the specialty of critical care medicine, a fact that is reflected by the substantial increase in the number of studies published in this field. Although the ERC and the American Heart Association (AHA) both published post-resuscitation care guidelines in 2010 [2, 3], this year, for the first time, the ERC has collaborated with the European Society of Intensive Care Medicine (ESICM) to produce European post-resuscitation care guidelines [4].

Since 2000, ILCOR has published its International Consensus on Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) Science with Treatment Recommendations (CoSTR) in 5-year cycles. The most recent ILCOR 2015 International Consensus Conference on CPR Science was held in Dallas in February 2015; the consensus science statements and

treatment recommendations were published simultaneously in *Resuscitation* and *Circulation* [5, 6].

As part of the 2015 evidence evaluation process, the ILCOR advanced life support (ALS) task force reviewed post-resuscitation care topics. Using the PICO (population, intervention, comparator, outcome) format, questions were identified and prioritised and experts working in pairs completed detailed systematic reviews. The task force used the methodological approach for evidence evaluation and development of recommendations proposed by the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Working Group. A detailed search for relevant articles was performed in each of three online databases (MEDLINE, Embase, and the Cochrane Library) [7]. The quality of the evidence (or confidence in the estimate of the effect) was categorised as high, moderate, low or very low, based on the study methodologies and the risk of bias, inconsistency, indirectness, imprecision and publication bias. Written summaries of evidence for each outcome (the Consensus on Science statements) were drafted by the evidence reviewers and then discussed, debated and refined by the task forces until consensus was reached. Finally, consensus-based treatment recommendations were designated as strong or weak and either for or against a therapy or diagnostic test [5, 8].

The 2015 CoSTR underpins the 2015 ERC and ESICM post-resuscitation care guidelines. The treatment recommendations in CoSTR reflect the available science and the international consensus that could be achieved—in most cases the recommendations lack the detail that is required to inform the resuscitation practitioner precisely how to treat the patient. The ERC-ESICM guidelines on post-resuscitation care are intended to be much more practical and more didactic, i.e. they tell the clinician exactly what to do. They cover the whole post-cardiac arrest patient pathway and include elements of pre-hospital care, in-hospital treatment and finally rehabilitation.

Animal studies suggest that after return of spontaneous circulation (ROSC), hyperoxia may worsen neurological

injury [9]. Clinical data on neurological injury are conflicting but a recent study of air versus supplemental oxygen in ST-elevation myocardial infarction showed deleterious effects of oxygen treatment [10]. As soon as arterial blood oxygen saturation can be monitored reliably, the ERC-ESICM recommendation is to titrate the inspired oxygen concentration to maintain the arterial blood oxygen saturation in the range of 94–98 %. As yet, there are no prospective data defining an optimal plasma carbon dioxide target in the post-cardiac arrest patient, and observational data are inconsistent. Until further data are available the recommendation is to aim for normocarbida.

If cardiac arrest has been caused by an acute coronary occlusion, achieving coronary reperfusion as soon as possible is a high priority. Emergent cardiac catheterisation laboratory evaluation (and immediate percutaneous coronary intervention (PCI) if required) should be performed in adult patients with ROSC after out-of-hospital cardiac arrest (OHCA) of suspected cardiac origin with ST-elevation (STE) on the ECG. This recommendation is relatively non-controversial; the management of those patients with a likely cardiac cause of their cardiac arrest but without STE on the ECG is less well defined. In general, it is reasonable to discuss and consider emergent cardiac catheterisation laboratory evaluation after ROSC in patients with the highest risk of a coronary cause for their cardiac arrest. The ERC-ESICM guidelines include recommendations on the timing of computed tomography (CT) scanning in relation to coronary catheterisation and these are summarised in a post-cardiac arrest algorithm.

The prevention of post-ROSC hyperthermia and the implementation of targeted temperature management (TTM) remains a strong recommendation in the ERC-ESICM guidelines. There is no international consensus on the precise target temperature—the current recommendation is to maintain a constant temperature in the range 32–36 °C for 24 h [11].

Predicting the final neurological outcome of those who remain comatose after resuscitation from cardiac arrest is problematic and it is now generally accepted that decisions about withdrawal of life-sustaining treatment (WLST) have been made far too early. The ERC and ESICM have already

published guidelines on prognostication after cardiac arrest [12] and these have been incorporated into the 2015 post-resuscitation care guidelines. The principles of prognostication are that it is generally delayed until at least 3 days after cardiac arrest and it is multimodal.

Many cardiac arrest survivors have cognitive and emotional problems long after hospital discharge. To date, there have been few structured programmes to rehabilitate these patients and this is a component of the patient pathway that can be improved considerably. The ERC-ESICM guidelines provide recommendations on the follow-up care for post-cardiac arrest patients.

Since 2010, considerable progress in clinical research has created important advances, making these post-resuscitation guidelines immediately applicable in many patients. However, there are still knowledge gaps, which require further investigation. Temperature management is probably the field in which most questions remain unsolved. Should we use a specific cooling technique? What is the best sedation strategy during cooling? Who are the best candidates for a lower target temperature target (32–34 °C) [13]? Should we start cooling during transport to hospital? As early pneumonia is very frequent in cooled patients, should we give prophylactic antibiotics? Ongoing clinical studies might provide definitive conclusions in the very near future. The optimal management of post-resuscitation circulatory failure also remains controversial. Although some clinical data suggest 75 mmHg as a target for mean arterial pressure, this should be further investigated in prospective studies. The use of steroids during the post-resuscitation shock also requires further exploration. Brain injury is the cornerstone of outcome: new imaging and electrophysiological investigations will help to refine the neuroprognostication strategy that has been proposed. Finally, follow-up care for survivors is now recommended but we need high-level evidence for this rehabilitation phase [14].

While further science is awaited, we sincerely hope that these 2015 guidelines will help intensive care clinicians to treat their post-cardiac arrest patients.

Compliance with ethical standards

Conflicts of interest None.

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