



European Resuscitation Council Guidelines for Resuscitation: 2017 update



Gavin D. Perkins*, Theresa M. Olasveengen, Ian Maconochie, Jasmeet Soar, Jonathan Wyllie, Robert Greif, Andrew Lockey, Federico Semeraro, Patrick Van de Voorde, Carsten Lott, Koenraad G. Monsieurs, Jerry P. Nolan, on behalf of the European Resuscitation Council¹

European Resuscitation Council, Emile Vanderveldelaan 35, BE-2845, Niel, Belgium

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Introduction

As a founding member of the International Liaison Committee on Resuscitation (ILCOR), the European Resuscitation Council (ERC) remains wholeheartedly committed to supporting ILCOR's mission, vision and values [1]. One of the main functions of ILCOR over the last 25 years has been to review published research evidence periodically to produce an international Consensus on Science with Treatment Recommendations (CoSTR). Since 2000, ILCOR has provided an updated CoSTR every 5 years [2–5] which the ERC has subsequently incorporated into its guidelines [6–8]. In recent years, the scale and pace of new clinical trials and observational studies in resuscitation science has grown exponentially. This prompted ILCOR to review its approach to evidence synthesis and to transition from a 5-yearly CoSTR to more regular updates, driven by the publication of new science rather than arbitrary time point anchors.

The first output of this new process was published in November 2017 and focused on the relationship between chest compression and ventilation during CPR [9].

The ERC welcomes the new, more responsive approach to evidence synthesis developed by ILCOR. In embracing this approach, the ERC has considered how best to integrate any changes prompted by ILCOR into our guidelines. The ERC recognises the substantial time, effort and resources required to implement changes to resuscitation guidelines [10]. The ERC is also cognisant of the confusion that could be caused by frequent changes to guidelines, which could impair technical and non-technical skill performance and adversely impact patient outcomes. Nevertheless, if new science emerges which presents compelling evidence of benefits or harms, prompt action must be taken to translate it immediately into clinical practice.

In an attempt to balance these conflicting priorities, the ERC has decided to maintain a 5-yearly cycle for routine updates to its guidelines and course materials. Each new CoSTR published by ILCOR will be reviewed by the ERC Guidelines and Education Development Committees that will assess the likely impact of the new CoSTR on our guidelines and education programmes. These committees will consider the potential impact of implementing any new CoSTR (lives saved, improved neurological outcome, reduced

* Corresponding author.

E-mail address: g.d.perkins@warwick.ac.uk (G.D. Perkins).

¹ Named Collaborators: Jos Bruinenberg, Marios Georgiou, Tony Handley, Leo Bossaert, Bernd W. Böttiger, Anatolij Truhlar, Hildigunnur Svavarsdóttir, Diana Cimpoesu.

costs) against the challenges (cost, logistical consequences, dissemination and communication) of change. CoSTRs which present compelling new data which challenge the ERC's current guidelines or educational strategy will be identified for high priority implementation; guidelines and course materials will then be updated outside the 5-year review period. By contrast, new information which will lead to less critical, incremental changes to our guidelines will be identified for lower priority implementation. Such changes will be introduced during the routine, 5-yearly update of guidelines.

ILCOR CoSTR 2017

The ILCOR CoSTR 2017 addressed different approaches to chest compression and ventilation (compression-only CPR, compressions with asynchronous ventilations (ventilations delivered without pausing chest compressions), compressions with passive oxygen inflation, and various compression to ventilation ratios (5:1, 15:2, 30:2, 50:2) in a variety of contexts. The systematic review and meta-analysis identified 28 unique studies (one cluster randomised trial, three individual patient randomised studies, 24 cohort studies) [11]. Evidence was synthesised in six domains – Dispatcher-assisted CPR [12], Bystander delivered CPR [13], Emergency Medical Services (EMS) delivered CPR [14], compression to ventilation ratio [14], in-hospital resuscitation [15], and paediatric resuscitation [16]. The overall quality of evidence ranged from very low to high which supported 4 strong and 10 weak treatment recommendations. The ERC considered each of the new CoSTRs in the context of contemporary resuscitation practice in Europe. Table 1 presents a summary of the ERC guidelines, relevant changes and the timeframe for implementation. More detailed information is presented in the sub-sections below. No new evidence for neonatal resuscitation was identified so these guidelines remain unchanged. Adult, paediatric and neonatal algorithms are presented in Figs. 1 and 2.

Dispatcher assisted CPR [13]

Recent evidence reinforces the importance of bystander CPR to improve survival from cardiac arrest [17–21]. The ERC recognises the critical role that the EMS dispatcher and dispatch protocols play in supporting bystander initiated CPR [22–26].

ERC 2017 guidelines

The key recommendations from the ERC remain that “dispatchers should provide telephone-CPR instructions in all cases of suspected cardiac arrest unless a trained provider is already delivering CPR. Where instructions are required for an adult victim, dispatchers should provide compression-only CPR instructions. If the victim is a child, dispatchers should instruct callers to provide both ventilations and chest compressions. Dispatchers should therefore be trained to provide instructions for both techniques [27].

ILCOR CoSTR in context of ERC guidelines

The ERC Guidelines are concordant with the ILCOR treatment recommendation that “dispatchers provide instructions to perform continuous chest compressions (i.e. compression-only CPR) to callers for adults with suspected out-of-hospital cardiac arrest.” The ERC notes the gaps in knowledge identified by ILCOR and highlights the need for further research particularly in relation to improving identification of cardiac arrest [28], when to include ventilations as part of the dispatcher instructor sequence, and the role of enhanced citizen/first responder schemes [29–34].

Bystander CPR (adults) [13]

Several public health initiatives have successfully increased bystander CPR rates and cardiac arrest survival, [19,35–39] emphasising the importance of engaging lay rescuers in efforts to improve outcomes for patients who suffer sudden out-of-hospital cardiac arrest. One of the key questions related to bystander CPR is whether lay rescuers should be trained to provide compression-only CPR or compressions and ventilations. This question was addressed in one of the observational studies assessing the effects of nationwide dissemination of compression-only CPR for lay rescuers [36], and consequently added to ILCOR's most recent evidence review. While crude analysis of patient outcomes between the two groups favoured compressions and ventilations (30:2), significant differences in demographic and prognostic factors between the two groups complicate the interpretation of data.

ERC 2017 guidelines

The ERC recommends that the adult BLS sequence remains unchanged and continues to endorse ILCOR's recommendations that “all CPR providers should perform chest compressions for all patients in cardiac arrest. CPR providers trained and able to perform rescue breaths should perform chest compressions and rescue breaths” [27].

ILCOR CoSTR in context of ERC guidelines

The ERC guidance is concordant with the ILCOR treatment recommendation that “chest compressions should be performed for all patients in cardiac arrest” as well as ILCOR's suggestion that “those who are trained, able and willing to give rescue breaths do so for all adult patients in cardiac arrest”. The crude analysis of unadjusted data from the Iwami study [36], published after the ERC 2015 guidelines were finalised, supports the ERC position that combined compressions and ventilations may be superior to compression-only CPR”. Although there is significant uncertainty about the effect in that study, it does not contradict the current ERC recommendation to perform both compression and ventilations as that may provide additional benefit for children and those who sustain an asphyxial cardiac arrest [40–43], or where the EMS response interval is prolonged [44].

EMS-delivered CPR (adults) [14]

A recent large randomised controlled trial compared positive pressure ventilations delivered by EMS personnel with a bag-mask without pausing chest compressions (asynchronous ventilation) to a control group receiving conventional CPR (30:2) before placement of an advanced airway [45]. There was no demonstrable benefit for survival to discharge among patients who were randomised to continuous compressions with asynchronous ventilation (difference, –0.7%; 95% confidence interval [CI], –1.5 to 0.1; P = 0.07) [45]. The publication of this trial prompted ILCOR to update the systematic review and evidence evaluation of EMS-delivered CPR.

ERC 2017 guidelines

The ERC's key recommendation remains that EMS providers perform CPR with 30 compressions to 2 ventilations before placement of an advanced airway. Once a tracheal tube or supraglottic device has been inserted, ventilate the lungs at 10 breaths min⁻¹ and compress the chest at a rate of 100–120 per minute.

The ERC does not recommend “minimally interrupted cardiac resuscitation” (continuous chest compressions with passive

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