

EDITORIAL

The new European Resuscitation Council guidelines on cardiopulmonary resuscitation and post-resuscitation care: great opportunities for anaesthesiologists

Focus on lay people, hospitals and prognostication

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Every 5 years and under the umbrella of the International Liaison Committee on Resuscitation (www.ilcor.edu) – representing resuscitation councils from all parts of the world – the ‘International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations’ is derived from the scientific analysis of all published studies in the field of resuscitation.¹ Based on the results of this worldwide collaboration, and using the highest possible levels of scientific evidence, the European Resuscitation Council (ERC) has produced the new ERC guidelines on cardiopulmonary resuscitation (CPR) and post-resuscitation care. They were published on 15 October 2015 and are available at www.erc.edu and consist of more than 1000 pages².

Several of the 2015 key recommendations can already be found in the previous CPR guidelines because, for consistency, we have kept key messages from 2010 whenever possible, and we have made relevant and important changes where required by new evidence. The most important new recommendations aimed at increasing survival following out-of-hospital cardiac arrest highlight a marked increase in lay resuscitation rates, ‘telephone CPR’ by dispatch centres, first responder systems, ‘cardiac arrest centres’ and prognostication. A major new initiative in the 2015 ERC guidelines is the recommendation to educate school children in CPR – worldwide.²

Sudden cardiac death with unsuccessful out-of-hospital CPR is responsible for more than 350 000 unexpected

deaths every year in the European Union³ and, based on extrapolation from the US data, this is ranked third in the causes of death in industrialised nations after cancer and other cardio-circulatory diseases.⁴ This unacceptable situation can be improved markedly and the 2015 ERC guidelines for CPR show how this may be achieved.

Cardiopulmonary resuscitation 2015 at a glance

For thoracic compressions, the new guidelines recommend a compression depth of about 5 cm and not more than 6 cm. Moreover, the frequency should be between 100 and 120 per minute.^{2,5} Any pauses in thoracic compressions of more than 5 to 10 s are associated with a decrease in both survival rate and prognosis and should, therefore, definitely be avoided.⁵ For ventilation and airway management, experts should intubate the trachea without any interruption of thoracic compressions if possible. As an alternative, and for less experienced providers, we recommend use of a supra-glottic airway device. Capnography is mandatory. Reversible causes of cardiac arrest are explicitly mentioned in the new guidelines, and they should always be taken into active consideration.⁵ For in-hospital patient care, so-called ‘rapid response teams (RRTs)’, with predefined alert criteria, can help to reduce the number of cardiac arrests and CPR in hospitals.^{2,6} Team debriefing is associated with a better performance and with an increase in survival rates.⁷ Therefore, all this is clearly recommended now. On board, commercial airlines – explicitly including the low-cost carriers – adequate CPR equipment and automatic external defibrillators should be available.

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Cardiopulmonary resuscitation as a matter of course for lay people

An out-of-hospital cardiac arrest is witnessed by lay bystanders in 50 to 70% of cases and most occur at home and within the family. Emergency medical service systems usually take 8 to 12 min and sometimes much longer to be on scene. The brain starts to die after 3 to 5 min, which highlights the critically important 'time window for lay resuscitation'.⁸ An immediate start of CPR by lay persons is pivotal for survival so starting CPR should be a must for all lay people. Immediate commencement of CPR by lay bystanders can increase the survival rate by two to four-fold.⁹ For adult victims, if a lay bystander is not able or not willing to perform ventilation, thoracic compressions alone are in most cases enough for survival within the first minutes. The new guidelines therefore recommend 'compression only CPR' in such cases. We recommend that all lay people should be educated adequately in CPR, including thoracic compressions and ventilation, with a ratio of 30 compressions to two ventilations.¹⁰

The most important way to increase CPR skills in lay people over the forthcoming years is by education of school children in CPR. We recommend 2 h/year starting before puberty to be repeated every year as long as they go to school. School children can be effectively educated by medical personnel or by specially educated teachers.¹¹ In Germany, we have managed to get such a nationwide recommendation by the school ministers in 2014, and the Italian school minister enacted a law on this in 2015. Following our activities, the concept of 'Kids save lives' is now also supported and officially endorsed by the WHO in 2015.^{12,13} In 2012, the German Resuscitation Council together with many other organisations had already developed a core curriculum for educating school children in CPR. This curriculum is available in German and English language versions on the website of the German Resuscitation Council (www.grc-org.de).

Dispatch centres, 'telephone cardiopulmonary resuscitation' and 'first responder'

All dispatch centres should instruct all lay bystanders in thoracic compression by telephone, in the event of a cardiac arrest.¹⁰ This 'telephone CPR' is effective with a number needed to treat of around 7. More and more dispatch centres use telephone instruction of lay persons in CPR and in some European countries, this is already mandatory. Moreover, intelligent systems guiding the 'first responder' by smartphone alarming in parallel with the emergency medical service services to reach the cardiac arrest victim early are associated with measurable benefits¹⁴ and are now recommended.

'All that is needed is two hands'

This statement was made in the 1960 *JAMA* publication from Kouwenhoven *et al.*¹⁵ on modern CPR and is still

valid today. All available evidence suggests that manual CPR is at least as effective as using any kind of mechanical chest compression device. And in some studies, use of mechanical chest compression devices led to significantly worse neurological outcome.^{16,17} Mechanical devices are always associated with periods of interruption of chest compressions and we already know that these interruptions need to be as short as possible.⁵ The new guidelines do not recommend mechanical chest compression devices for routine use⁵ but they may be useful in special circumstances, such as prolonged CPR, CPR during transport and CPR during cardiac catheterisation.

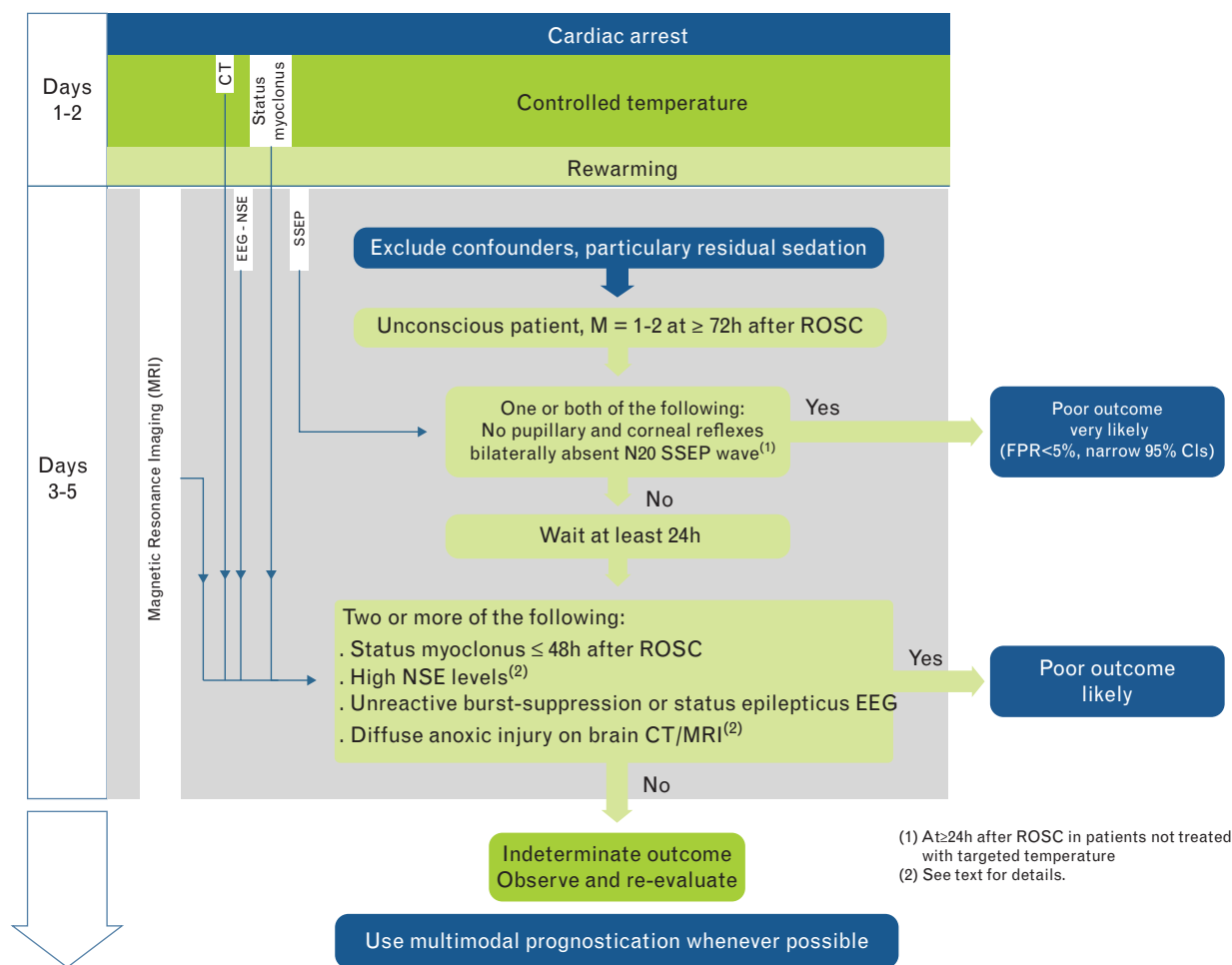
Post-cardiac arrest treatment in 'cardiac arrest centres'

Survival following out-of-hospital cardiac arrest is significantly better if the patients – in individual cases during on-going CPR – are brought to and treated in special centres, so-called 'cardiac arrest centres'. Such centres must always have the immediate ability to perform acute percutaneous coronary intervention, should have a high specific caseload of cardiac arrest patients and should be able and willing to perform temperature management 7 days a week and 24 h a day.² In most cases, out-of-hospital cardiac arrest is the result of an acute obstruction of a coronary artery. If the arrest-related coronary arteries are re-opened within 1 or 2 h after this event, there is a marked increase in the survival rate.¹⁸ For temperature management, the new guidelines recommend 'targeted temperature management'; following out-of-hospital and in-hospital cardiac arrest of any initial rhythm, unconscious patients should be treated with a constant temperature between 32 and 36°C for at least 24 h.^{2,19–21} It should be mentioned here that the target temperature of 36°C has been determined in a study where the median down time between collapse and start of CPR was 1 min only.²² Fever should be avoided at least for 3 days after cardiac arrest, and normoxia is associated with better survival.

Prognostication: the totally new approach

Some of the most important and most relevant changes in the new guidelines have been made in the field of prognostication.^{19–21} This will hopefully make another strong impact on survival. We know that active withdrawal of intensive care therapy and life support is the reason for death in around 50% of all post-cardiac arrest patients. There is serious concern that the quality of the decision to withdraw further therapy was not adequate in many patients in the past. Therefore, we now have totally new, highly evidence-based multimodal guidelines and algorithms for prognostication (Fig. 1). Based on the newest evidence in this field, it is particularly important that any decision following prognostication should not be executed within the first 72 h after return of spontaneous circulation. Even at 72 h, only the absence of corneal and pupillary responses and pathological somatosensory

Fig. 1



ERC and ESICM 2015 guidelines prognostication strategy algorithm. CI, confidence interval; EEG, electroencephalography; ERC, European Resuscitation Council; ESICM, European Society of Intensive Care Medicine; FPR, false-positive rate; NSE, neuron-specific enolase; ROSC, return of spontaneous circulation; SSEP, somatosensory evoked potentials.^{20–22}

evoked potentials are recommended.^{19–21} Even then, they are still associated with a false-positive rate of up to 5%, that is, decisions based on these criteria may be wrong in one out of 20 patients. If they do not show clear results, it is now recommended to wait for another 24 h – that is, until 96 h after return of spontaneous circulation – until further assessments and investigations may be used. And it is very important to realise that all these additional investigations have shown much lower levels of sensitivity and specificity. Therefore, it is recommended to use them in combination only (Fig. 1).^{19–21}

‘Rapid response teams’ and in-hospital cardiac arrest

The new guidelines now recommend ‘RRTs’ and ‘medical emergency teams’ (METs).² Such teams are usually activated when vital signs of patients on peripheral wards are outside a pre-defined range. The establishment of such teams can be associated with lower

incidence rates of in-hospital cardiac arrest and death.⁶ The establishment of RRTs and METs is a great chance for anaesthesiologists – the special skills needed are within the key competencies of our specialty.

Great opportunities for anaesthesiologists

The new 2015 guidelines on cardiopulmonary resuscitation offer great opportunities for anaesthesiologists. We can become more publicly visible with our activities in educating lay people and in particular school children in CPR.^{3,11–13} For anaesthesiologists, it is also important to know that the motto of the ERC initiated ‘European Restart a Heart Day’ in 2016 is ‘Kids Save Lives’, training school children in CPR. For the past 3 years, the ‘European Restart a Heart Day’ is always on 16 October, the ‘World Anaesthesia Day’. Because 16 October is a Sunday this year, the ERC has decided to train the school children all over Europe on Tuesday, 18 October 2016 (www.erc.edu/www.restartaheart.eu).

Apart from these great opportunities, many of us are active as out-of-hospital emergency physicians, we are often responsible for in-hospital cardiac arrest care, and we are often responsible for intensive care and prognostication in cardiac arrest patients. The implementation of RRTs and METs saves lives⁶ and can be one of our key strategic in-hospital developments in the very near future.

By comprehensively implementing these new guidelines, we should be able to save 100 000 lives per year in Europe.³

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