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Practice Guideline

European Resuscitation Council Guidelines 2025 Education for Resuscitation

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Abstract

These Resuscitation Guidelines 2025 of the European Resuscitation Council (ERC) on Education for Resuscitation are based on the 2025 Consensus of Science with Treatment Recommendations (CoSTR) of the International Liaison Committee on Resuscitation (ILCOR), reviews of peer-reviewed literature and expert consensus. These guidelines provide directions for laypeople and healthcare professionals on teaching and learning the competencies (knowledge, skills, and attitudes) for resuscitation for in-hospital and out-of-hospital cardiac arrest of all age groups. Furthermore, the guidelines focus on technology-enhanced learning, simulation-based resuscitation education, assessment, feedback and debriefing, faculty development, and educational effects on patient outcomes.

Keywords: Education, Training, Learning, Cardiopulmonary resuscitation, Simulation, Guideline, ERC

Introduction

These European Resuscitation Council (ERC) Guidelines 2025 Education for Resuscitation offer evidence-informed guidance for laypeople and healthcare professionals (HCPs) about teaching and learning the lifesaving competencies of resuscitation (knowledge, skills and attitudes) with the aim of improving patient outcomes (Fig. 1). This guidance addresses the second key component of the Utstein formula of survival, namely 'educational efficiency' (Fig. 2). As education is the link between scientific findings and their implementation into practice, we present the components of education in resuscitation in more detail. The effects of educational interventions in resuscitation are maximised by incorporating educational theory.[1,2] These guidelines address education in various settings where people may teach and learn resuscitation, including every level from basic to advanced life support and for all ages of learners and all cardiac arrest victims. Key stakeholders to be targeted include governmental (healthcare, education, etc.) and political authorities who manage national and/or regional healthcare systems (Fig. 1).

The foundational principles of medical education serve as the blueprint for creating a comprehensive educational structure. This framework incorporates various learning theories and teaching strategies to offer a wider range of methods in resuscitation education. Over the last decade, simulation and technology (and more recently artificial intelligence (AI)) have gained increasing importance

Abbreviations: ERC, European Resuscitation Council, CoSTR, Consensus of Science with Treatment Recommendations, ILCOR, International Liaison Committee on Resuscitation, HCPs, Healthcare professionals, AI, Artificial Intelligence, CPR, cardiopulmonary resuscitation, BLS, Basic Life Support, AED, Automated external defibrillator, ALS, Advanced Life Support, ILS, Immediate Life Support, PBLS, Paediatric Basic Life Support, NLS, Newborn Life Support, VR, virtual reality, AR, augmented reality, VLE, virtual learning environment, EMS, Emergency Medical Services, HBB, Helping Babies Breathe, PAD, Public Access Defibrillator, RCT, Randomised controlled trial

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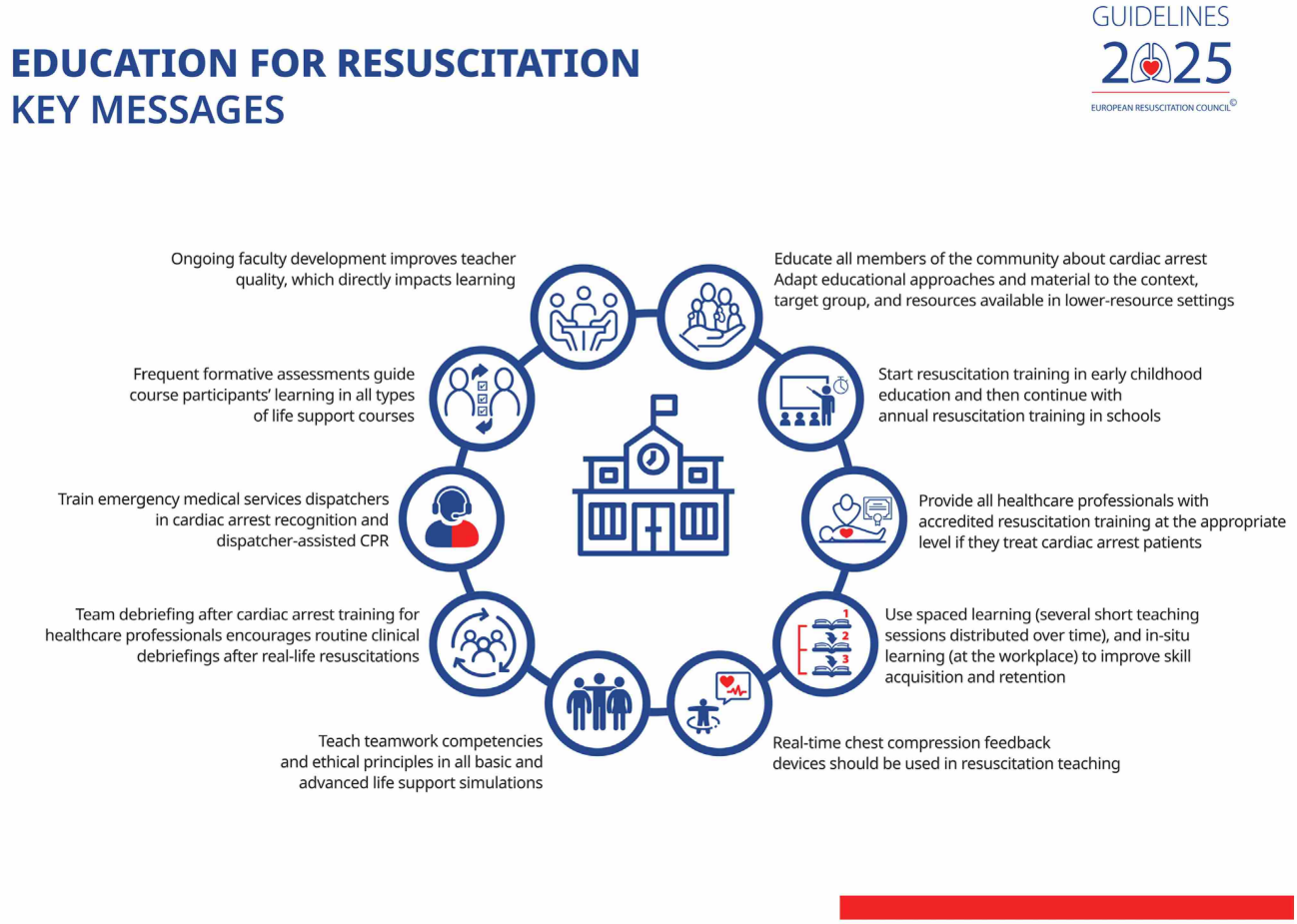


Fig. 1 – Education for resuscitation – key messages.

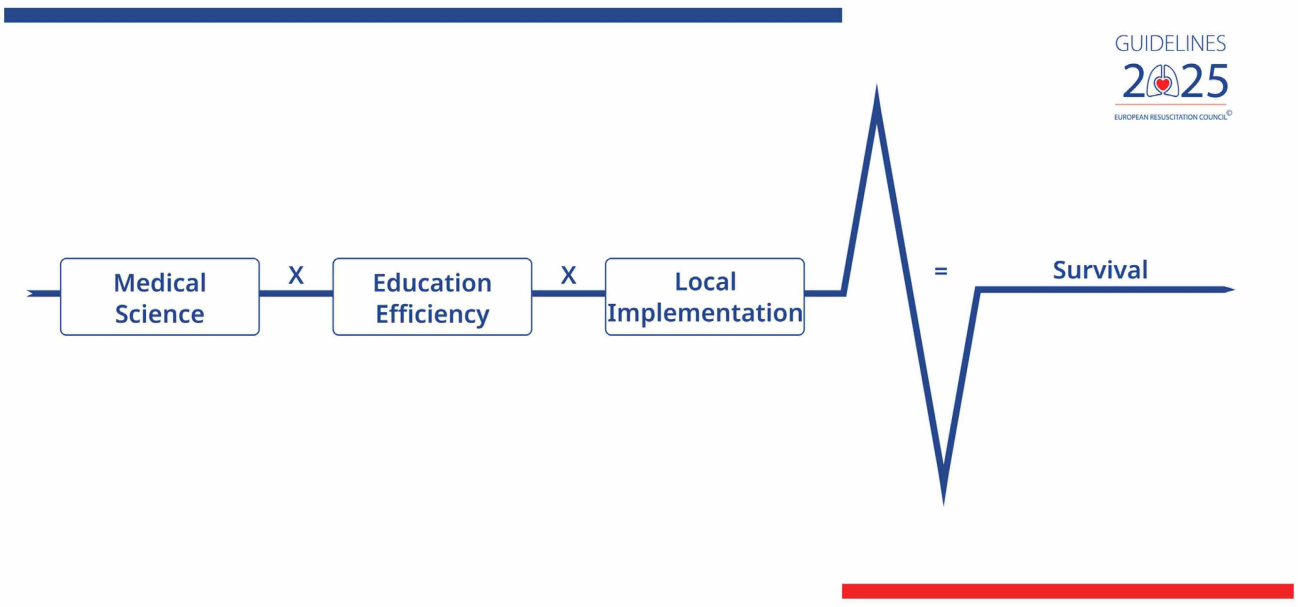


Fig. 2 – The Utstein formula of survival.

in education and have changed how ERC implements its resuscitation teaching.[3] A summary of key educational strategies referred to in these guidelines is presented in Fig. 3.

Throughout these guidelines, the term CPR relates to the specific technical skills of cardiopulmonary resuscitation (e.g., performance metrics of chest compression and ventilation), whilst resuscitation is used as a generic term covering the broader range of skills and interventions. The term bystander is used to describe rescuers who happen to be at the scene to provide help, and the term first responder is used for those who have additional training and are alerted to attend the scene of a cardiac arrest. Healthcare professionals (HCPs) are those who work in any healthcare sector (prehospital or in-hospital). Laypeople are persons not working in the healthcare sector. Basic life support (BLS) is defined as initiating the chain of survival, early high-quality chest compression, effective ventilation, and the early use of an automated external defibrillator (AED). Any form of resuscitation education beyond BLS is described generically as advanced life support (neonatal, paediatric, and adult life support). Where the term 'ALS' is used, this refers specifically to the ERC adult Advanced Life Support course. The writing group of these ERC Guidelines 2025 Education for Resuscitation considered the recently introduced ERC approach to diversity, equality, equity, and inclusion (DEI) while writing these guideline, and applied it whenever possible, recognising and realising that this is a field for improvement in the production of evidence-informed guidelines.

These ERC Guidelines on Education for Resuscitation 2025 are based on the annual Consensus of Science with Treatment Recommendations (CoSTR) of the International Liaison Committee on Resuscitation (ILCOR).[4–7] An expert group was convened to review these recommendations, along with available selected peer-reviewed literature. This body of evidence was then discussed and agreed upon within the Education Writing Group and the ERC Guidelines 2025 Steering Committee. The educational co-chairs of the corresponding ERC science and education committees reviewed and agreed on the parts concerning their specific course format. These Guidelines were posted for public comment between 5. and 30. May 2025. A total of 53 comments were submitted, leading to one change in the final version. Subsequently, the feedback was reviewed by the writing group, and the guidelines were then updated. These Guidelines were presented to and approved by the ERC Board and the ERC General Assembly in June 2025. The methodology for the development of the guidelines is outlined in the Executive Summary.[8] Table 1 summarises the main changes in the ERC Guidelines for Education for Resuscitation between 2021 and 2025 (Table 1).

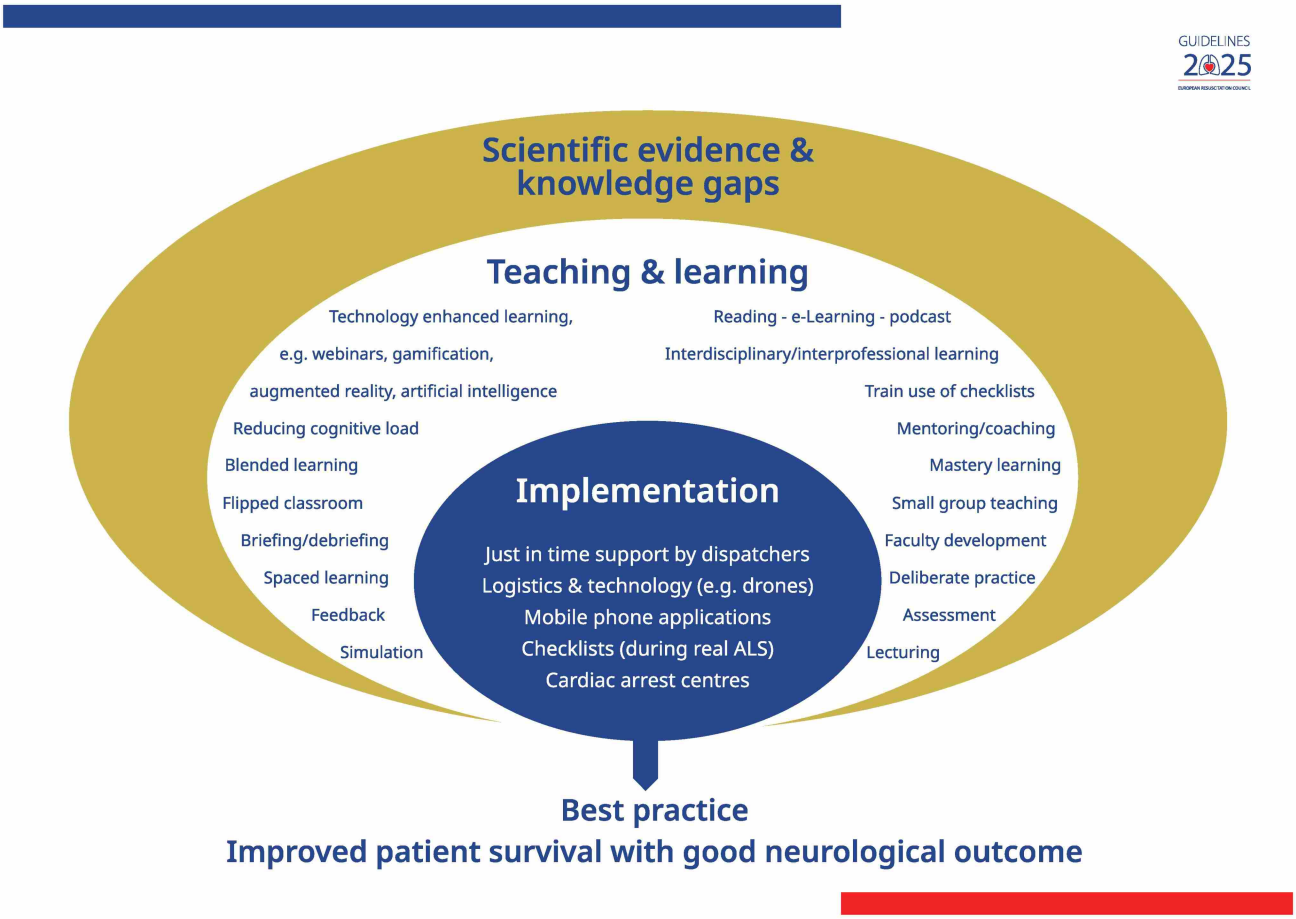


Fig. 3 – ERC educational approach to best practice and improved patient outcomes.

Table 1 – Main changes in the ERC Guidelines for Education for Resuscitation: 2021 compared with 2025.

Topic	2021 Guidelines	2025 Guidelines
Resuscitation educationtailored for specific groups of life-saving rescuers	Not included	- Introduce resuscitation training early in childhood education (around 4–6 years of age) and incorporate annual resuscitation training into school curricula. - Tailor the required CPR training to the provider's role, their specific setting, and specific patient populations. - Train emergency medical services dispatchers in cardiac arrest recognition and telephone-assisted CPR guidance.
Educational methods to teach high-quality resuscitation competencies	Not included	- Use blended and self-directed learning to provide flexibility and accessibility for all learners of resuscitation. - Consider gamified learning as a component of resuscitation training for all types of basic and advanced life support courses. - Use real-time CPR feedback devices to improve chest compression skill acquisition and accuracy. - Use Rapid Cycle Deliberate Practice as an effective learning strategy to master skills rapidly for all types of basic and advanced life support courses. - Use stepwise approaches for structured skill acquisition, but strict adherence to a four-step approach is not always necessary. - HCPs should use cognitive aids to enhance protocol adherence during resuscitation, but bystanders should refrain from using cognitive aids as this may delay critical actions. - Integrate ethical training into HCPs resuscitation education. - Include training of team competencies in all life support courses (incl. non-technical skills and human factors during resuscitation).
Technology-enhanced learning (TEL) for resuscitation	- Learning CPR can be supported by the use of smartphones, tablets, etc. - They improve retention and facilitate competency assessment in CPR. - Gamified learning may engage many learners. - Virtual learning environments are recommended as part of a blended learning approach.	- Use online learning modalities (e.g. podcasts, videos, social media) to provide flexibility in time and location for learners and to promote asynchronous learning. - Augmented reality for life support training possibly adds value to the learning process. - Applications and artificial intelligence might facilitate assessment and teaching during resuscitation courses.
Simulation-based resuscitation education	Specific team or leadership training should be included in advanced life support simulation.	- In-situ learning (at the workplace) should be considered as an option for CPR simulation where resources are readily available. - Consider the inclusion of a CPR coach as a member of the resuscitation team during CPR simulation. - Debriefing scripts support instructors during debriefing after simulation.
Faculty development	Three aspects of faculty development are important: selection of suitable instructors, initial instructor training, and maintenance and regular update of their teaching quality.	- The ERC recommends faculty development programs for all instructors teaching life support courses. - Select trainers with medical education expertise to conduct faculty development programmes.
Feedback and debriefing in life support courses	Not included	- A concise team debriefing after cardiac arrest training for HCPs can encourage routine clinical debriefings after real-life resuscitations.
Resuscitation education in low-resource settings and remote areas.	Not included	- Adapt educational approaches and materials, and awareness campaigns to the context and resources available in lower-resource settings. - Consider distance learning, technology-enhanced learning, hybrid resuscitation training, and the use of low-cost (self-made) manikins.

Concise guidelines for clinical practice

Resuscitation education tailored for specific groups of life-saving rescuers

- Educate all members of the community about cardiac arrest awareness and cardiac arrest treatment and consider the diversity of the target group.
- Introduce early resuscitation training starting in early childhood education (around 4–6 years of age) and incorporate annual resuscitation training into school curricula.
- Provide all HCPs with accredited resuscitation training.
- Tailor the required CPR training to the provider's role, their specific setting, and/or specific patient populations.
- Train emergency medical services dispatchers in cardiac arrest recognition and telephone-assisted CPR guidance.

Educational methods to teach high-quality resuscitation competencies

- Use blended and self-directed learning to provide flexibility and accessibility for all learners of resuscitation.
- Consider gamified learning as a component of resuscitation training for all types of basic and advanced life support courses.
- Use real-time CPR feedback devices to improve chest compression skill acquisition and accuracy.
- Use Rapid Cycle Deliberate Practice as an effective learning strategy to master skills rapidly.
- Use spaced learning to improve acquisition and retention of competencies.
- Use stepwise approaches for structured skill acquisition.Strict adherence to a four-step approach is not always necessary.
- HCPs should consider using cognitive aids during resuscitation training to enhance protocol adherence. Bystanders should not use them as this may delay critical actions.
- Integrate ethical training into HCP resuscitation education.
- Regardless of the rescuer's background, basic life support education should include effective chest compressions, safe use of an AED, and ventilation of the lungs.
- Teach two-person ventilation when using a self-inflating bag and mask.
- Address in BLS training barriers that rescuers might experience in performing CPR and factors increasing rescuers' willingness to perform CPR.
- Include training of team competencies in all life support courses (incl. non-technical skills and human factors during resuscitation).

Technology-enhanced learning (TEL) for resuscitation

- Use online learning modalities (e.g. podcasts, videos, social media) to provide flexibility in time and location for learners and to promote asynchronous learning.
- Use augmented reality for life support training as it possibly adds value to the learning process.
- Consider applications and artificial intelligence, which might facilitate assessment and teaching during resuscitation courses.

Simulation-based resuscitation education

- Use high-fidelity manikins when training centres/organisations have the infrastructure, trained personnel, and resources available. Use low-fidelity manikins for standard advanced life support training where high-fidelity manikins are not available.
- Use in-situ simulation (at the workplace) as an option for CPR training where resources are readily available.
- Include the teaching of teamwork competencies in basic and advanced life support simulations.
- Consider the inclusion of a CPR coach as a member of the resuscitation team during CPR simulation.
- Use debriefing scripts to support instructors during debriefing after simulation.

Assessment in resuscitation education

- Use frequent formative assessments in all life support courses to provide instructors with information for targeted feedback and to support learning.
- Use checklists to support assessment decisions.

Feedback and debriefing in life support courses

- Ensure feedback is a two-way discussion between the giver and the recipient, driven by an authentic interest in the learner's improvement.
- Consider using a concise team debriefing after cardiac arrest training for HCPs to encourage routine clinical debriefings after real-life resuscitations.

Faculty development

- The ERC recommends faculty development programs for all instructors teaching life support courses.
- Select trainers with medical education expertise to conduct faculty development programmes.
- Implement faculty development programs that enable participants to establish a positive learning climate, practice effective educative leadership, communicate learning goals, implement robust assessment and feedback strategies, and evaluate course programs for continuous improvement.

Effect of resuscitation education on outcome

- HCPs providing advanced life support to adults should attend accredited adult advanced life support training.
- HCPs providing advanced life support for newborns and babies should attend accredited neonatal resuscitation training (NRT) courses such as Newborn Life Support.
- For HCPs providing care for newborns and babies in out-of-hospital low-resource settings, we recommend participation in the Helping Babies Breathe (HBB) support program.
- Other accredited life support courses (e.g., paediatric life support) are recommended, even though less evidence on the effect on patient outcomes is available.

Resuscitation education in low-resource settings and remote areas

- Adapt educational approaches and materials, and awareness campaigns to the context and available resources.
- Consider distance learning, technology-enhanced learning, hybrid resuscitation training, and the use of low-cost (self-made) manikins.

The evidence informing the guidelines

Resuscitation education tailored for specific groups of life-saving rescuers

A systemic approach to resuscitation education is required to educate all laypeople, first responders, and HCPs to provide immediate CPR and defibrillation where appropriate for cardiac arrest. However, resuscitation education, like any other subject, is not a one-size-fits-all concept and should be tailored to the specific needs and situations of the learners, the specific patient groups, or the rescuers.[9] Various resource settings mandate different levels of training programmes, which need to be weighed against feasibility and economics.

Resuscitation providers, from laypeople to HCPs, need to acquire different competencies based on their different training requirements. The learning objectives for laypeople are the immediate call for help, cardiac arrest (CA) recognition, and early and effective initiation of BLS.[10–12]

An ILCOR scoping review found scarce evidence on tailored courses or training for specific adult populations (e.g., Down syndrome, visual or hearing impairment). Tailoring involves addressing specific impairments. In accordance with ILCOR ERC recommends that while evidence on which groups need which adaptations is limited, tailoring should be considered when feasible.[13]

In light of the known disparities of persons attending resuscitation training,[14,15] tailoring means also adapting course materials and manikins to differences like skin colour, gender or body shape, reflecting the diversity of the target population.[15,16] Specifically, course organisers and instructors should consider using diverse, race-, gender-, and/or age-adapted manikins if available.

Children can be trained in resuscitation skills from a young age through to higher education, as shown by the ERC's successful KIDS SAVE LIVES program.[17] This resuscitation education needs to be adapted to the age of the learners because of their differing abilities to perform skills and to understand the underpinning theory.[18–24] Teachers are already experts in teaching and therefore need only to learn the specific resuscitation skills they will subsequently teach to their students.[17,25,26] Such resuscitation teaching should be included in the curricula of teachers' education.[23] Evidence is scarce on which educational strategy is the most effective for teaching school children.[27–30] However, one study has derived suggestions for improving content and teaching strategies from the perspective of schoolchildren and their teachers.[24] Therefore, the format for teaching CPR will vary with local requirements and circumstances. For more details see the ERC Guidelines 2025 *Systems Saving Lives*.[31]

Emergency medical service (EMS) dispatchers play a vital role in guiding bystanders using telephone-assisted CPR. Dispatchers thus need to be proficient in recognising a cardiac arrest from the description provided by the caller.[7,32–34] While there is a small risk of performing chest compressions on someone not in cardiac arrest,[35] this risk is far outweighed by the danger of withholding compressions when they are necessary.[7,36] Common challenges include recognising agonal breathing or gasping[37,38] and engaging callers to help the victim.[32,33,39] Programmes that improve the incidence and quality of telephone-assisted CPR have improved patient outcomes,[40,41] and specific training can overcome the barriers and challenges in providing CPR.[42–44] Artificial intelligence can support dispatchers, but currently not enough evidence exists to recommend its routine use.[45,46] If a specific telephone-assisted CPR course for dispatchers is created, it should include cardiac arrest recognition and safety, engagement with callers to start CPR, indications for and performance of chest-compression-only CPR, instruction in high-quality CPR including the use of an AED, the support of arriving first responders, drones and EMS at the scene, and resuscitation debriefing.[7,47]

Resuscitation training programs for HCPs at different levels of response and duty should be mandatory because they are in regular contact with patients at risk of cardiac arrest. According to the workplace, respective training should be tailored to the required skill level, the specific setting, and the anticipated frequency of responding to emergencies (e.g., via accredited life support training courses at the appropriate level and for the appropriate age group), as well as to their specific setting.[7,48,49]

Educational methods to teach high-quality resuscitation competencies

In any teaching–learning process, the first step is to define 'what to teach'. That means defining competencies and learning objectives needed for the target audience (e.g., school students, lifeguards, and HCPs). Once the learning objectives and content are established, a well-structured educational process defines 'how to teach'. The last step in this process is the assessment of the teaching success, "Are you now able to do it?".

Effective education needs human resources (e.g., instructors) and teaching materials (e.g., simulation classrooms). The role of the instructor is to facilitate learning in a safe and motivating environment, encouraging active student participation and assessment of the learning success in all course formats and with all learners.

Educational methods for resuscitation

Integrating ethics into resuscitation education is essential for preparing all rescuers in the application of ethical principles under pressure. For laypeople, training should address key concerns such as the willingness to help, hesitation to intervene, and awareness of Good Samaritan laws that protect bystanders acting as rescuers. Healthcare professionals need to be equipped to navigate advance care planning, engage in patient-centred shared decision-making, apply do-not-attempt-resuscitation (DNACPR) decisions, and make informed decisions about when to terminate resuscitation efforts.

Ensuring equitable access to ethics education reduces uncertainty, builds confidence among providers, and promotes resuscitation decisions that respect patient rights and reflect ethical best practices. For further guidance, see the ERC 2025 Guidelines on Ethics in Resuscitation.

Blended learning,[4,50] self-directed learning,[51] gamification,[52] cognitive aids[53] and augmented reality[7,54] were assessed by ILCOR and found to be effective for CPR training for HCPs and laypeople.

Blended learning combines digital resources with on-site teaching and hands-on practice, enabling resuscitation training even in remote locations.[4,50] It also enables consistent messaging, namely for pre-course preparation.[50] Although its implementation might face barriers in low-resource settings, it remains an effective strategy, which is at least as effective as face-to-face training.[4,50,55]

Self-directed learning, in contrast to teacher-led learning, is particularly useful and effective for basic techniques such as chest compressions and AED use, especially in low-resource settings.[51] Most studies found no differences in CPR quality, AED use, knowledge, confidence and willingness to help between self-directed and

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instructor-led training,[4,51,56,57] which makes self-directed learning probably cost-effective and recommendable where instructor-led training is not feasible.

Gamification refers to the use of game-like elements (competition, point systems, scaffolded levels of difficulty, leaderboards), usually in a digital format, to encourage interactive and intuitive participation by learners.[58] Gamification for CPR training enhances learners' outcomes (skill, knowledge, attitude), and participation, particularly in teamwork and problem-solving, and improves learners' attitudes during training and could be a valuable component in resuscitation training. [7,52,59] A gamification strategy could include engaging narratives, progressive challenges, immediate feedback, collaboration, and/or meaningful rewards. Most studies showed improvements in at least one domain of learner outcomes when gamified learning elements were included, but the heterogeneity in their applications results in very low certainty of evidence supporting these findings.[7,52,60–63] with one study even reporting negative effects on CPR quality and time to apply an effective AED shock.[64] An updated search identified three additional studies consistent with the previous findings.[51] Therefore, gamified learning should be considered as a component of resuscitation training for all types of basic and advanced life support courses.[7,52]

Immersive technologies, such as virtual reality (VR) and augmented reality (AR), have shown mixed results for training resuscitation skills.[54] Overall, studies find that AR results in favourable or no different learning outcomes compared with other BLS training methods,[7,54] whereas results for VR are mixed with some studies suggesting inferior learning outcomes for VR alone when compared to other training methods.[7,54,65–71] Thus, VR and AR may be used for resuscitation teaching[7,54] but VR should not be used as the sole method.

The flipped classroom approach reverses the traditional learning environment.[72] Instead of passively receiving information in a classroom, learners are first introduced to the CPR learning material outside the classroom, often through online videos, readings, or other resources organized in a virtual learning environment (VLE). Then, during the on-site in-class resuscitation course time, learners engage in active learning activities during simulations, case studies, and hands-on practice, facilitated by an instructor.

Hands-on training and feedback

Feedback is essential to ensure learning during high-quality skills training, and it can come from different sources. Use of CPR feedback devices improves chest compression quality metrics during the training of lay and professional rescuers. [73–79] However, there is insufficient evidence to determine the value of ventilation feedback devices for teaching CPR skills.

Learning strategies

Rapid Cycle Deliberate Practice (RCDP) is characterised by pausing the scenario if needed to enable correction. The learner can then repeat the skill until it is mastered.[80] In simulated ALS scenarios it significantly reduces pauses for defibrillation and medication administration.[7,81,82] While the inclusion of RCDP in both BLS and ALS courses seems reasonable, its application has mainly been limited to HCPs in training, with no studies yet in laypeople, first responders, or in low-resource settings. Skill retention outcomes are mixed, highlighting the need for further analysis of long-term effectiveness.[7,82]

Spaced learning distributes smaller or shorter training sessions over time, which improves retention of practical skills compared to massed learning.[83,84] Two recent studies concluded that spaced learning was more effective than massed learning for BLS skill retention.[85,86] Spaced learning frequency should be adapted to the needs of the learners and the organisation. However, the optimal scheduling of training sessions and the timing and frequency of sessions remains uncertain.[87] Nonetheless, the repetition of resuscitation competencies adapted to the learners' needs at least once a year seems reasonable.[83,87,88]

A stepwise approach to teach CPR skills involves organising teaching into progressive phases that optimise the acquisition of basic and advanced skills.[89] Whilst the stepwise approach to skills teaching is used widely in resuscitation training, there is no evidence to support one model over other stepwise methodologies.[6,89] An ILCOR review specifically looked into the effectiveness of Peyton's four-step approach for teaching resuscitation skills compared with alternative approaches, and 14 of 17 studies found no difference in skill acquisition or retention.[89] It is reasonable to limit stepwise skills teaching to skills of low to moderate complexity.[89–91] The ERC in line with ILCOR recommends that the number and order of steps should be adapted according to contextual factors such as the time available for teaching (with a focus on practice time), the complexity of the skill taught, and the group composition of participants (e.g., beginners vs. experts; lay persons vs. HCPs; group sizes).

Cognitive aids, such as decision-making algorithms and checklists, incorporated in resuscitation improve adherence to guidelines and reduce cognitive load during emergencies for HCPs.[53] Therefore, instructors should consider their use during resuscitation training. Bystanders should not use them as this may delay critical actions, therefore, their benefit during bystander training remains unclear.

Educational goals in basic life support courses

Basic life support education in any setting needs to teach effective delivery of chest compressions and ventilations and the safe use of AEDs. Chest compressions can be taught from early childhood (4–6 years) but the effectiveness of chest compressions depends on the physical abilities of the rescuer.[19,20] Because of their user-oriented design, even untrained users (including children) should be able to follow the instructions to use an AED safely.[92] However, training of AED use including rescuer safety is still beneficial.[93–95]

Traditionally, BLS courses teach every rescuer mouth-to-mouth/nose and/or mouth-to-mask ventilation. Ventilation is an important skill, especially in certain situations such as paediatric cardiac arrest, drowning, or asphyxia. In some cases—such as when there is a risk of infection—bag-mask ventilation may be the preferred method. However, mastering this skill can be challenging for many non-HCPs and even for some HCPs, particularly those who do not use bag-mask ventilation regularly in clinical practice. Nonetheless, improving proficiency in this technique can result in at least partial lung ventilation, which is preferable to providing no ventilation at all.

Performing two-person ventilation, with one holding the mask with two hands (two-hand mask ventilation) and the other squeezing the bag, may improve the seal of the mask and the chance of effective oxygenation and ventilation and therefore is the recommended technique.[96] The Education Writing Group suggests teaching bag-mask ventilation to first responders and HCPs who normally provide

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BLS, especially when there is a risk of infection. In contrast to mouth-to-mouth ventilation, bag-mask ventilation during training on a manikin carries no risk of infection.

Basic Life Support (BLS) courses should include guidance on effective communication with EMS dispatchers, focusing on how to provide and receive accurate information to avoid unnecessary delays in starting resuscitation. First responders should also learn how to deliver a structured handover to emergency medical services (EMS) or HCPs.[97] The specific BLS competencies taught should be tailored to the needs of the learner group—there is no one-size-fits-all approach.

Resuscitation courses should address barriers to performing CPR that rescuers might experience. These include: personal factors (e.g., emotional barriers, panic), socio-economic factors (e.g., gender issues[98], cultural beliefs), physical factors (e.g., ability to place the patient flat), CPR competency (e.g., skill deficits, fear of causing injury/doing something wrong), and procedural issues (e.g., communication and language barriers, recognition of cardiac arrest).[6,14,99,100]

Factors that increase rescuers' willingness to perform CPR are prior CPR training, community CPR awareness programmes, chest compression-only programmes in massed training, and CPR-trained rescuers with a higher educational degree.[51,101] BLS education plays an important role in encouraging broader participation of rescuers in community programmes that aim to provide help for people in life-threatening situations (e.g., first aid, first responder systems, public AED programmes, and schoolchildren's CPR programmes).[51,102,103]

There is no one duration of BLS courses that suits all learners, because this depends on the previous resuscitation education of the rescuers, the specific learning goals for a given group of learners, and local societal and cultural educational factors. Examples range from very short BLS introductory sessions to 2-hour or longer BLS courses for all types of learners.[104–106] An example of the former is the ERC fan-zone training sessions that were developed for the ERC UEFA awareness campaign during the European Football Championship 2024, which had a mean duration of 5 min. The theoretical background needed for BLS of any type can be taught online as part of a blended learning approach to reserve the on-site training time for hands-on practice.

Educational goals in advanced life support

Basic life support is an integral part of any type of ALS education but needs to be adapted to the learners. Specific learning goals for neonatal, paediatric, and adult life support are airway management, manual defibrillation, vascular access, a structured approach to managing critically ill patients, application of advanced resuscitation in special situations and circumstances, treatment of *peri*-arrest arrhythmias, and immediate post-resuscitation care. The time and effort to teach these competencies should be adapted to the learners' profession and clinical duties. For this reason, ERC ILS/ALS courses have implemented a modular approach to adapt courses to the needs of participants. A core part of these courses is team competencies,[7,107] which include team leadership, task allocation, structured communication, and handovers.[108,109] The teaching of teamwork competencies should improve patient care and may reduce medical errors and improve patient safety.[109–111]

Technology-enhanced learning (TEL) for resuscitation

Technology-enhanced learning (TEL) refers to the effective use of educational technologies to achieve specific learning objectives. It can facilitate, support, and enrich both teaching and learning, making resuscitation education more accessible, engaging, and effective. These innovative tools have the potential to rapidly transform how resuscitation is taught.[112] Real-time chest compression feedback devices,[73] especially those incorporating gamified learning elements, can make training more enjoyable and effective.[52] Immersive technologies such as augmented reality enable learners to engage with complex, lifelike scenarios in a safe, controlled environment. TEL strategies promote the development of both technical and non-technical skills, including decision-making, teamwork, and situational awareness.[113] Despite these advances, several common barriers to the adoption of TEL in resuscitation education remain. These include hardware costs, software reliability, limited access, reluctance to adopt new technologies,[6] and varying levels of user proficiency.[1]

Online learning and artificial intelligence in resuscitation education

Online learning modalities, including podcasts and social media,[114] provide flexibility in time and location and enable learners to access content conveniently thus promoting asynchronous learning and emphasising learner autonomy.[50,115] Online learning is often integrated into blended learning strategies to enhance engagement and knowledge transfer for the on-site, hands-on training.[50]

Artificial intelligence (AI) simulates human intelligence, including learning, reasoning, problem-solving, and decision-making, through rules, algorithms and data processing. Generative AI may assist in resuscitation teaching.[77,78] Despite the increasing popularity of AI,[116] there is very little evidence on how AI can influence resuscitation education. A scoping review found six applications of AI in resuscitation education: measuring and providing feedback on CPR performance, personalising learning trajectories, detecting ineffective communication, generating medical images for resuscitation training, creating interactive and adaptive online simulations, and enabling AI-powered chatbots to answer resuscitation-related questions.[117] Multiple AI tools that measure successful CPR metrics have been published.[118–122] Some of them can provide direct feedback.[121,123] Further promising applications are creating personalised learning trajectories and helping detect ineffective verbal communication during resuscitation training.[118,124,125] In a test of a generative AI's (ChatGPT AI model, free research preview, March 14, 2023 version) ability to provide accurate and comprehensive answers to lay persons' questions about cardiac arrest and CPR, experts in the field agreed that the generative AI provided largely accurate, relevant and comprehensive answers.[126] However, it still needs to be optimised for use in early clinical education.[127]

Concerns about AI use in resuscitation education include the need for expert validation of content and teaching material,[128,129] and ethical concerns regarding data privacy and algorithm bias.

Simulation-based resuscitation education

Simulation has been a key component of life support education for many years. It relies on the concept of a willing suspension of disbelief, enabling learners to develop skills and behaviours that may push them beyond their comfort zone to indicate a learning process.[130–132]

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The advantages extend beyond individuals to entire teams, enhancing both technical and non-technical skills and competencies training and collaboration.[109,133] By participating in simulations, learners can reinforce their real-world experiences, and this approach is especially effective for developing and managing human factors and team competencies. The recommendations on simulation for CPR training are based on new or updated evidence on various aspects (fidelity, in-situ learning, gamified learning, team competencies, CPR coaching, and scripted debriefing) that contribute to this approach.[7,51]

Fidelity

High-fidelity manikins have been introduced to enhance learner engagement by increasing physical realism. Physical realism means the presence of physical features, be it visible, palpable, and/or audible, that are designed to increase the resemblance of the manikin to an actual patient.[134] This enables participants to train in an environment that more accurately reflects real clinical practice.[135–137] A systematic review comparing the use of high-fidelity manikins with low-fidelity manikins for BLS and ALS training (adults, paediatrics and neonatal) included 21 studies.[51,134] The use of high-fidelity manikins favoured skill performance at course conclusion, CPR parameters at course conclusion, and attitudes and preferences. At course conclusion, no difference between the two groups was found for knowledge, time to task performance, or teamwork. There was also no difference in clinical performance and knowledge at 3 months or greater. In summary, high-fidelity manikins can be used for CPR training when training centres or organisations have the infrastructure, trained personnel, and resources to maintain the program. The use of high-fidelity manikins improved skill after ALS courses but did not show advantages over low-fidelity manikins in BLS teaching.[134] The substantial costs of the implementation and maintenance of high-fidelity manikins limit their adoption in lower-resource settings. When high-fidelity manikins are not available, it is reasonable to use low-fidelity manikins for standard ALS training.[134]

In-situ learning

Providing training within patient care areas has the theoretical advantage of providing learning in the context of the real clinical environment and assessing the organisational structure.[138] A systematic review comparing in-situ (workplace based) simulation-based CPR training with traditional training for HCPs included four studies.[139] One non-randomised study reported an association between in-situ training and higher odds of survival at hospital discharge in children who experienced cardiac arrest.[140] Another non-randomised study reported a lower incidence of patient complications in newborn resuscitation during the period when in-situ training was ongoing.[141] In situ simulation may be considered as an option for CPR simulation, as it might improve patient survival, clinical performance, and teamwork competencies in actual resuscitations.[51,139]

Team competencies

Team competencies can be defined as non-technical skills related to teamwork, including team-related communication, specifying goals, structured handovers, coordinated behaviours, task allocation, sharing the mental model, situational awareness, and performance monitoring.[7,107] Simulation-based resuscitation training is the domain for team competencies training and their inclusion has shown to improve performance and, whilst outcomes vary, their impact has been largely positive.[7,107,142] A systematic review, which was recently updated, included a total of 19 studies and identified variable but mainly positive outcomes in relation to team competencies.[7,107]

CPR coaching in CPR simulation

A CPR coach is a resuscitation team member whose primary responsibility is to provide real-time coaching on resuscitation quality. A systematic review comparing the use of a CPR coach with no coach in healthcare teams managing adult or paediatric cardiac arrest included seven studies.[143] CPR performance in both clinical and simulation settings was improved with use of a CPR coach. There was also greater adherence to guidelines in a simulation setting. As no harmful effects were observed and CPR coaches are already included in resuscitation teams in many hospitals, it is reasonable to include them in cardiac arrest resuscitation teams in sufficiently staffed settings.[143] Therefore, the ERC advises considering the inclusion of CPR coach training in life support courses.

Scripted debriefing

Debriefing scripts and tools have been developed to help standardise the approach to debriefing during resuscitation training.[144] None of the six studies included in a recent scoping review reported patient or process outcomes in real resuscitations.[145] However, a good practice statement supports the use of scripted debriefings after simulation in resuscitation because they may improve learning and performance.[7,145]

Assessment in resuscitation education

Learner assessment is essential to determine whether the competencies outlined in the learning objectives have been achieved. Key components of assessment include direct observation of performance, asking clarifying questions to understand the learner's reasoning, and encouraging self-assessment, which can offer valuable insights for discussion during feedback sessions. Assessment results can be documented using either advanced digital tools or traditional paper-based checklists. Reliable and validated tools are necessary for this purpose.[146] Objectively recorded CPR quality data can also support both assessment and subsequent data-driven feedback.[73] This contributes to robust and defensible assessment outcomes, ensuring credibility for course participants and for stakeholders who require certification.

An instructor's perspective during assessment enables critical reflection on participants' self-assessments, which may sometimes differ from their actual performance. Multiple assessments conducted over time by different assessors provide a more comprehensive picture of learner performance. These can be used for ongoing feedback and development (formative assessment), or to evaluate competence through small, spaced summative assessments (continuous assessment). Initial evaluations of this approach have shown no effect on pass–fail rates, but have reported increased learner satisfaction; however, more rigorous research is needed to confirm these findings.[147]

Summative assessments, typically conducted at the end of training, are used to determine whether the required competency level has been reached and usually serve as the basis for awarding course completion certificates.

Feedback and debriefing in life-support courses

Feedback and debriefing are essential elements of resuscitation courses as both strategies are powerful interventions to promote

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learning.[144,148–151] Feedback and debriefing are related concepts and sometimes cannot be separated easily, yet the concepts serve different purposes and have distinct characteristics. Whilst feedback primarily aims at providing specific and timely guidance for immediate performance improvements, debriefing seeks to facilitate deeper reflection and understanding to enhance long-term development. This section provides principles of feedback for life support courses and gives a rationale for incorporating team debriefings into simulated cardiac arrest teaching.[152]

Feedback

Feedback aims to provide specific performance information to help improve future actions, mostly to promote immediate improvement. Feedback is not a 'one-way' input by the feedback provider,[153] but also requires the skill and literacy of the feedback recipient.[154] Contemporary feedback avoids ritualistic rules such as 'praise and criticism need to be balanced'.[153] Instead, feedback providers should develop an authentic interest in the learner's improvement by offering a shared perspective on the learner's performance, which includes a learning-friendly climate with sufficient psychological safety[155] and both parties agree on an educational alliance.[156] Real-time coaching, as one kind of feedback, has been shown to improve CPR quality and adherence to guidelines among HCPs predominantly in a simulated setting.[143]

Different levels of feedback have been described,[148,149] which explains its variable effects, ranging from negative (if feedback is given unspecific and with negative connotations)[157] to highly positive (if feedback focuses on identifying strengths and areas for improvement). Feedback which promotes self-regulation in learners has a significant positive impact on their development and performance. At the self-regulated level, feedback moves beyond just indicating whether an answer is right or wrong (task level) or suggesting a better process (process level). Instead, it focuses on empowering the learner to monitor their own learning, evaluate their own work, and direct their own learning.[149] It should be a conversation exploring the individual path of the learner to improve their performance. By formulating the next learning goals, the learner's motivation for achieving these is increased.

In life support courses, feedback sessions should be concise so that there is sufficient time to focus on the course's core learning objectives. However, brief reflection on key principles underlying effective performance—such as teamwork competencies—is essential. To gain learner engagement, it is helpful to begin with points raised by participants, often emerging during the team debriefing. Nonetheless, the instructor's perspective on performance is equally important and should be addressed. Because resuscitation is a team effort rather than a solo 'heroic' act, the entire group should be involved in identifying strategies for improvement. Any relevant open questions should be answered before summarising the key learning points.

Team debriefing as part of cardiac arrest scenario teaching

Debriefing as part of Kolb's learning cycle[158] aims to reflect on and analyse an activity to understand what and why it happened and how it can be improved.[150,159] Compared with feedback, debriefing tends to be less directive and less focused on specific actions,[160] as debriefing aims to change the learners' frames for long-term development.[159,160] Debriefings in clinical settings can help the resuscitation team cope with significant events (e.g., a stressful resuscitation in real life), or be used for quality assurance (e.g., after a routine resuscitation). In clinical practice, team debriefings have been shown to improve outcomes.[51,161–166] For this reason, after performing a cardiac arrest training scenario, participants should practice to perform a concise short clinical team debriefing to practice this self-reflection and encourage such a debriefing after real resuscitation situations. During training, such team debriefing can provide valuable insights for instructors and serve as a starting point for the feedback session. The team debriefing after cardiac arrest training that is performed between the course participants should not be confused with the feedback provided afterwards by instructors which is used to initiate reflection on the performance during the training.

Faculty development

The quality of teaching delivered by instructors has the largest effect on learning outcomes.[167] A systematic review of *meta*-analyses in higher education found that faculty development significantly impacted student achievement.[168] *How* a method is applied has more impact on learning than *which* method is used. Effective instructors carefully design their courses, set clear learning goals, and provide meaningful, tailored feedback.[168] Although the importance of faculty development is widely recognised and implemented in instructor curricula, evidence of which educational methods and curricula are effective is limited, especially in resuscitation training.

Faculty development programmes can be evaluated by the impact on trained instructors (e.g., are teaching skills improved), on learners (e.g., are learnt skills implemented and used), and on outcomes the learners achieve applying the learnt competencies in their own practice (e.g., is faculty development impacting patient outcomes).

Most studies on faculty development come from other medical education areas and provide indirect evidence for resuscitation.[169] The few comparative studies that explored whether trained instructors led to better learning outcomes,[170] were summarised in an ILCOR scoping review[4] and updated in 2025.[51] This recent update identified two studies indicating that instructor courses with reduced face-to-face time were as effective as traditional courses.[171,172] Two other studies showed that teaching instructors to recognise and correct common student mistakes led to better BLS performance.[173,174] This suggests that faculty development programs should focus on strategies to identify and address common errors.

Structured high-stakes education of instructors aiming to improve learner outcomes is needed, as inconsistent instructor quality and ineffective content delivery were observed in BLS courses,[175–178] or little difference between students taught by trained versus untrained instructors was described.[179]

Three aspects of faculty development are important: selection of suitable instructors, initial instructor training, and maintenance and regular update of their teaching quality.

Selection of instructors

Instructors with diverse expertise and backgrounds should be recruited to teach resuscitation targeted at different learner groups. Some of these learners, particularly in BLS training sessions, might not have a professional background in healthcare (e.g., schoolteachers, lifeguards, volunteer members of first aid or charity organisations etc.). A systematic review found that schoolteachers, peer tutors, and medical students achieved similar educational outcomes compared with HCPs in resuscitation training for schoolchildren.[30]

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Non-HCP training for schoolchildren is a viable alternative, as it can be smoothly and cost-effectively integrated into school curricula.[17,30,180] Basic lifesaving skills can be learnt from engaged persons who can enthusiastically teach these competencies with relatively little content expertise. However, HCPs might be included as content experts in faculty development programmes for BLS instructors who teach schoolchildren or laypeople.

It is important to include an appropriate level of knowledge to explain the details and the evidence behind the taught CPR competencies whilst avoiding overstraining the cognitive capacity of the learners. Future instructors should be aware of becoming role models paired with an appreciation of effective learning and motivational skills. Teaching should help learners understand when and how to apply what they've learned, and how their actions can influence patient outcomes. Because resources for faculty training are limited, selecting individuals who show supportive attitudes, intrinsic motivation, appropriate communication skills, and enthusiasm for resuscitation education is of utmost importance.

Instructor training

Faculty development in the form of seminars, workshops, series of teaching sessions, and fellowships are effective.[181] Practical learning formats, when coupled with constructive feedback,[153,182] are known as experiential learning and can be effective.[183–186] Instructor training needs to cover all teaching methods applied in courses that the instructors will teach, including the teaching of practical CPR skills, facilitation of interactive small-group learning, and basic presentation skills. Future instructors need to know how to establish competency-(outcome)-based teaching and learning settings, how to provide constructive and corrective feedback, and how to conduct valid assessments to guide further learning. They need to teach how to improve human factors, non-technical skills, interprofessional team competencies,[7,107] and how to use feedback devices during resuscitation training.[51,73]

Many BLS instructors, often non-HCPs, are required to teach larger population cohorts. Their teaching programs need to include how to demonstrate and perform high-quality CPR skills, how to provide immediate feedback on skills performance, how to answer questions properly, and how to use checklists for assessment. Their effective teaching can increase learner self-efficacy and learners' motivation to intervene promptly in an emergency.[187] Before teaching on actual courses, assessment of instructor competencies is needed. This should happen when future instructors teach courses under supervision with immediate peer support and feedback.

Maintenance of competencies

Maintaining competencies is essential for instructors, course directors, and educators to keep up with the developments in resuscitation and education science. This is the domain of self-directed, continuous professional development to avoid individuals 'doing their own thing'. Proposed strategies available are deliberate reflective practice, peer coaching, and establishing communities of practice. However, how educative competencies might best be maintained over time is unknown. Deliberate reflective practice describes self-reflection on one's performance to further improve performance,[188] including self-assessment[189,190] and acting as a role model.[191]

Peer coaching provides a valuable outside perspective, promotes mutual learning between peers, and strengthens communities of practice.[192,193] This can be performed within instructor teams during any course format. It requires mutual trust between instructors and might be the first step towards the development of communities of practice.

Communities of practice influence educational practice by sharing aims and views on teaching, and teaching materials, promoting peer coaching, and facilitating faster spread of information by helpful organisational support.[194] An example of such support is the ERC virtual learning environment CoSy, with virtual web-based formats of interaction, webinars and networking, or the educational instructor days.

Effect of resuscitation education on outcome

The ERC has a long history of delivering accredited life support training for HCPs covering the basic and advanced resuscitation of neonatal, paediatric, and adult patients. Participant attendance in life support courses incurs financial and time-related costs for both individuals and their institutions. It is therefore important, to show whether this participation has any meaningful impact on patient outcomes. Systematic reviews, including recent updates, showed improved survival of patients of all age groups if HCPs attended accredited advanced life support courses.[1,6,48,195]

The evidence is much more conclusive for the impact of hospital-based neonatal resuscitation training.[196] Overall, neonatal resuscitation training significantly improved patient outcomes, including the risk of stillbirths, neonatal mortality and perinatal mortality except for the 28-day neonatal mortality in low- to middle-resource settings. Helping Babies Breathe (HBB) is a simple and low-cost simulation-based training course designed to train HCPs in immediate neonatal resuscitation in resource-limited settings. A systematic review showed a reduced risk of intrapartum-related stillbirth and 1-day neonatal mortality after implementation of HBB training,[197] and an updated literature search included one further study reporting that implementation of HBB training was associated with significantly reduced perinatal mortality.[198]

The provision of accredited adult advanced life support training and neonatal resuscitation training is recommended for HCPs. Training such as Helping Babies Breathe is also recommended for HCPs in out-of-hospital low-resource settings. In the absence of demonstrable harm, it is reasonable to recommend similar accredited life support courses for e.g. paediatric life support, despite lacking evidence on their impact on patient outcomes.[51]

Resuscitation education in low-resource settings and remote areas

Resuscitation education in low-resource settings will be most effective when it is relevant to the learners' context. Recent narrative reviews from low-middle income countries[199–202] highlight that educational efforts need to be cognisant of factors such as cultural views and norms around death,[199–203] existing levels of community first aid knowledge, levels of training of HCPs dealing with out-of-hospital and in-hospital cardiac arrests, and resource availability.[204] Context may vary widely, even within countries,[202,205] and an adaptive approach towards available resources is advised.[206]

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Four components of education highlighted in this context are: raising general awareness about resuscitation; BLS education for laypeople; community first responder programs, and school children resuscitation teaching programs.[206] Distance, virtual, hybrid and blended learning methods[50] offer opportunities to educate in these areas at relatively low costs, although the content will require adaptation to the local context. Artificial intelligence chatbots might help translate resuscitation teaching material and support wider dissemination, though evidence suggests they are not yet reliable enough.[207] Mnemonics[21] and low-cost mannikins[208] may be particularly useful in low-resource settings. Ideally, training should be offered at no cost to participants.[209] Evidence about the effectiveness of particular resuscitation education in low-resource settings is limited. Useful examples for future interventions are:

Educating the community (laypeople, first-responders, and children)

A recent scoping review identified 55 interventions aimed at improving the community response to OHCA in resource-limited settings.[210] In low/low-medium income countries, only CPR and AED training (conducted via a range of modalities) has been evaluated. Most studies demonstrated resuscitation training increased short-term knowledge, and some showed increased CPR skills. This might impact upon subsequent care for patients in cardiac arrest, but no data on outcome is available.

Educating healthcare providers (HCPs) worldwide

Helping Babies Breathe is an example of content tailored to causes of neonatal death in low- to middle-income countries, that improved outcomes for babies.[49,197,211] The World Health Organization's basic emergency care training initiative increased confidence in frontline providers with content and language perceived as appropriately tailored to the local context,[212,213] although patient outcome data is not available.

Multiple countries highlight the investment and years required to develop emergency medicine specialists who can then train the emergency medical services workforce.[200,201] The Global Resuscitation Alliance[212] recommends a graded approach to strengthening systems in low-resource settings, which is consistent with an ILCOR consensus statement.[206] This recommends that education needs to be aligned with each graded development, e.g., public education alongside the introduction of an emergency medical system, or public access defibrillator familiarisation before or concurrent with the placement of public access defibrillators within communities. Resuscitation organisations that provide educational or research opportunities to early-career professionals should ensure equitable access to those from low-resource settings.[213]

It is acknowledged that most recommendations made in this education guideline have been derived from studies in high-resource settings. The evidence about their effectiveness or applicability in low-resource settings is lacking.[214]

Remote areas

Remote resuscitation training uses technologies like videoconferencing, telemedicine approaches, and smartphone applications, to deliver instruction in life-saving skills to individuals with limited access to traditional in-person curricula. Simulation-based remote paediatric resuscitation training was reported as effective.[215,216] Significant research on remote neonatal resuscitation training compared remote versus in-person training methods,[217] investigated the utility of digital technologies and smartphones,[218] and tele-simulation[219–221] over time. The studies showed either noninferiority to standard training or that neonatal resuscitation skills were improved from baseline. A recent scoping review summarises that lower-cost digital methods such as mobile applications, simulation games and/or mobile mentoring engage HCPs in skills learning and improve neonatal resuscitation.[222] Remote tele-coaching improved performance.[223] Virtual feedback, debriefing, and skill assessment via videoconferencing technologies were used successfully,[224–229] and virtual instructor training exists.[172]

Collaborators

The following individuals contributed as collaborators to the 2025 version of this guideline, Patricia Conaghan and Kevin Mackie.

Declaration of competing interest

Declarations of competing interests for all ERC Guidelines authors are displayed in a COI table which can be found online at https://doi.org/10.1016/j.resuscitation.2025.110739.

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