

2025 Korean Guidelines for Cardiopulmonary Resuscitation: Part 10. Education and system implementation for enhanced chain of survival

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The 2025 Korean education and system implementation guidelines were updated using a structured evidence evaluation process and recent systematic reviews. The guidelines present a comprehensive update that aims to bridge the gap between educational theory and clinical performance and emphasize the transition toward high-fidelity, field-based training environments through the implementation of *in situ* simulation and rapid cycle deliberate practice to foster automaticity in high-quality cardiopulmonary resuscitation (CPR) and team coordination. The integration of real-time feedback devices during training and the adoption of structured "hot" and "cold" debriefing to maximize learning outcomes are critical shifts in this update. Furthermore, these guidelines enhance teamwork competency by recommending the integration of a dedicated CPR coach within the hospital code team. Despite acknowledging the potential of digital health, a cautious approach toward gamified and blended learning is maintained. The guidelines prioritize face-to-face instruction to ensure psychomotor proficiency. From a policy perspective, the 2025 update removes the prehospital termination of resuscitation criteria in alignment with domestic legal constraints and social consensus. In addition to context-based training strategies within hospitals, we discussed the mandatory age for CPR training. We also added recommendations to address the "decoupling" between high automated external defibrillator awareness and low bystander utilization rates in the prehospital setting. In conclusion, the 2025 Korean guidelines emphasize repetitive, evidence-based educational methods and systematic policy refinements to enhance resuscitation quality and survival outcomes across clinical and community settings.

Keywords Cardiopulmonary resuscitation; Heart arrest; Education; Debriefing

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OVERVIEW

The 2025 Korean education and system implementation guidelines are updated using a structured evidence evaluation process and recent systematic reviews. The guidelines are based on the 2025 International Liaison Committee on Resuscitation Consensus on Science with Treatment Recommendations [1]. The major changes in the 2025 guidelines from the 2020 guidelines include diversifying training methods by applying field *in situ* simulation-based training, implementing various debriefing methods, and using rapid cycle deliberate practice (RCDP). These guidelines include strengthening feedback equipment, including team members trained in advanced life support (ALS) in hospital code teams, and strengthening teamwork training. Furthermore, the guidelines include recommendations to expand education for pediatric age groups and resolve the imbalance in cardiopulmonary resuscitation (CPR) education for the general public [2].

KEY UPDATES AND RECOMMENDATIONS

Establishing an environment for *in situ* simulation-based resuscitation training

In situ simulation-based resuscitation training is associated with improving survival rates, clinical performance, and quality of training [3–5]. We propose strengthening department-specific, field-based simulation training (*in situ* simulation) using high- or low-fidelity manikins depending on the institution's training infrastructure. Additionally, we recommend maximizing the effectiveness of the resuscitation team by including teamwork competency training and CPR coaches. We recommend using a structured debriefing script or checklist after the simulation to help instructors accurately convey key learning objectives (weak recommendation, very low certainty of evidence) [6,7].

Emphasizing post-CPR debriefing

Simulation-based resuscitation training is crucial for acquiring knowledge, technical skills, and nontechnical skills. Debriefing is crucial for achieving learning outcomes [8]. Immediate (hot) and delayed (cold) debriefing are applicable depending on institutional resources and work duty patterns. We recommend both methods to improve survival outcomes after cardiac arrest (strong recommendation, low certainty of evidence) [9–11].

Strengthening the use of feedback devices in CPR training

Since 2020, the level of evidence has been continuously strengthened, and effectiveness verification has been added. The use of

feedback devices is associated with deeper chest compression and a higher rate of achieving the appropriate compression rate recommended by resuscitation guidelines. Conversely, without a feedback device, compressions tend to be performed too quickly. To improve CPR performance, we recommend the use of equipment that provides direct feedback on chest compression rate, depth, relaxation, and hand position (strong recommendation, moderate certainty of evidence, with an extended grace period to account for the training equipment replacement cycle at training sites) [1].

Formation of in-hospital resuscitation teams

In addition to basic courses of CPR, healthcare providers should receive ALS training as part of their certification or continuing education, and hospital code teams should include team members trained in ALS (strong recommendation, low certainty of evidence).

Enhancing teamwork training

In-hospital CPR training curricula should incorporate teamwork training to improve resuscitation outcomes [12–15].

Reconsideration of non-face-to-face training modules, blended learning methods, and gamified learning

Studies on the benefits and cost-effectiveness of resuscitation training using blended learning methods have shown inconsistent results and differing measurement outcomes (knowledge, skills, attitudes, etc.). Therefore, we recommend applying this method only when educational resources and accessibility are limited. Blended learning is not routinely recommended, except when face-to-face training is impossible (strong recommendation in limited circumstances, very low certainty of evidence).

Given the infrequency of cardiac arrest situations and the difficulty of replicating them for teaching, comparative studies of virtual reality using a computer interface that simulates an emergency situation or a real environment and gamified learning through play with existing educational media are needed. Additionally, a sociopedagogical consensus is required on educational content and methods appropriate to the media properties, gamified learning definition and scope, and novelty effect. Furthermore, a sociopedagogical consensus is needed on the differentiation from education, media listing or attribute classification, and requirements for gamified learning. Domestic and international resuscitation education operation teams recognize the problems of mixing augmented reality, virtual reality, and gamified learning methods. Although the application of these methods increases

knowledge, confidence, and performance ability, evidence for their field application and improvement of prognosis remains insufficient (weak recommendation, very low certainty of evidence) [16,17].

Implementation of RCDP

RCDP is a high-repetition simulation method to rapidly improve resuscitation training proficiency. When learners make mistakes, the training is immediately stopped, real-time feedback is provided, and the correct technique is repeated, thereby preventing the entrenchment of incorrect habits [18–20]. This training is effective in forming automatic responses, which are essential for high-quality resuscitation and accurate execution of core protocols [19,21]. Therefore, RCDP improves resuscitation team performance more quickly and efficiently than traditional simulation methods (weak recommendation, very low certainty of evidence) [22].

Traditional training feedback focuses on debriefing, where learners reflect on their actions after completing all scenario simulations [19]. Conversely, RCDP provides immediate feedback on performance and sufficient time for repeated practice to improve performance (microdebriefing). This is a stepwise learning process, designed to be differentiated and ensure sufficient repetitive learning by gradually extending the learning stages. This learning method has already been implemented in the Korean Advanced Life Support (KALS) Provider Course by incorporating RCDP, and

its application will be maintained (Fig. 1).

Deletion of termination of resuscitation criteria in pre-hospital and emergency medical services

The 2020 guidelines proposed termination of resuscitation (TOR) criteria for adults with cardiac arrest, including criteria for termination of basic life support (BLS) in the prehospital setting and criteria for termination of ALS in the hospital setting [2]. These criteria were temporarily removed from the 2025 guidelines due to a lack of societal consensus on TOR or withholding resuscitation, the absence of follow-up studies on TOR in the healthcare environment, and the inability of emergency medical technicians to make these decisions independently due to domestic medical laws and circumstances in Korea.

Expanding the age of starting education and addressing training disparities for the general public

We recommend setting the starting age for CPR training at 10 years (upper elementary) and mandating “hands-only CPR” concepts for younger children. Community-based, customized CPR training programs should be developed for socially vulnerable groups and multicultural families. Furthermore, alternative training strategies and feedback-focused training that consider the physical and psychological limitations of specific groups, such as older adults and women, should be strengthened to improve educational accessibility and effectiveness. To strengthen the social

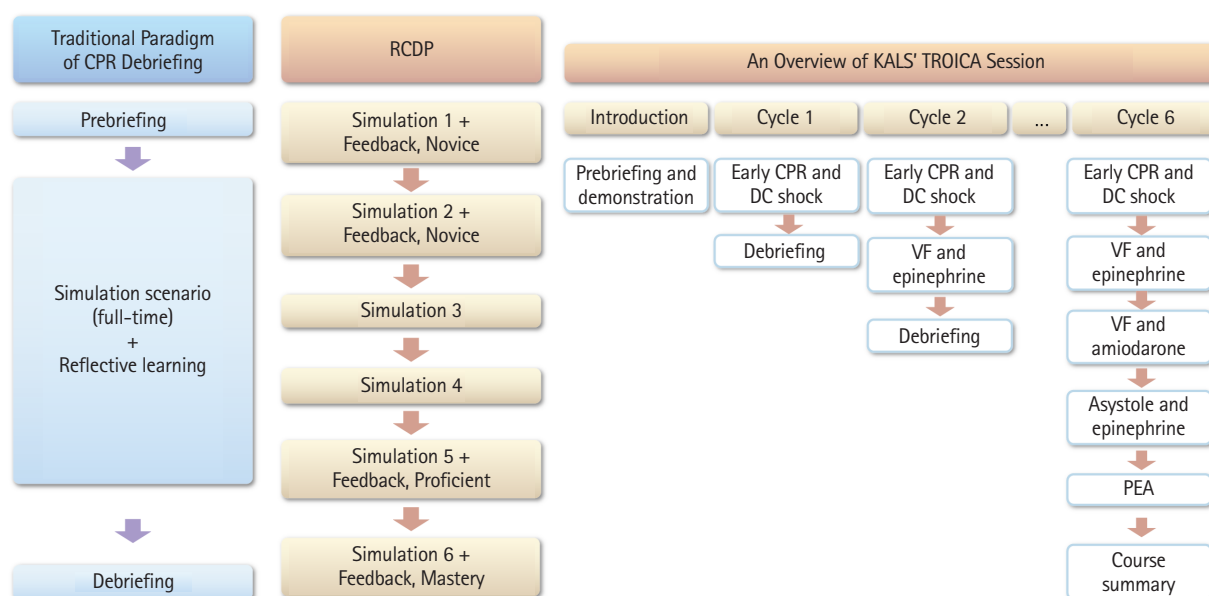


Fig. 1. Examples of practical application of rapid cycle deliberate practice (RCDP) in Korean cardiopulmonary resuscitation (CPR) training programs (e.g., Training of In-hospital Cardiac Arrest [TROICA] of Korean Advanced Life Support [KALS]). DC, direct current; VF, ventricular fibrillation; PEA, pulseless electrical activity.

safety network, financial support should be expanded for areas with limited access to CPR training. We should continue to work to establish legal mechanisms to improve the effectiveness of mandatory installation and management of automated external defibrillators (AEDs) [23–25].

Suggestions for resolving the gap in AED training rate and field use by the public (decoupling)

By strengthening domestic AED laws and institutional enforcement, public awareness of AED terminology, installation locations, and AED training rates increased to 94%, > 50%, and 36%–40%, respectively. However, the current disparity in the rate of AED use by laypersons in out-of-hospital cardiac arrest situations remains at approximately 2%, which is a significant issue in Korea. People do not use AEDs even when they are installed due to “not knowing where they are,” physical accessibility limitations (e.g., “invisible AEDs” installed inside buildings or closed at night or on holidays, making them inaccessible), psychological barriers (fear of making mistakes), and training effectiveness issues (lack of hands-on experience, confusion due to differences in the models of AEDs used for training and actually installed, etc.). In the future, AED training will be strengthened with context-based training that goes beyond simple skill acquisition and enhances actual field response capabilities.

CORE ELEMENTS OF THE 2025 KOREAN CPR GUIDELINES

Core pyramid of CPR education and implementation strategy

The CPR guidelines for education and system implementations recommend the operation of a rapid response system to prevent cardiac arrest in hospitals, integrated management of the community cardiac arrest care environment, and a community cardiac arrest data monitoring strategy [2]. The core pyramid of the newly proposed 2025 education and implementation strategies for improving cardiac arrest survival outcomes includes an emphasis on the new chain of survival (rehabilitation and recovery), various debriefing methods, RCDP or *in situ* simulation, and establishing systems to improve physical accessibility to AEDs (Fig. 2).

Expansion of CPR education for pediatric populations

CPR education for elementary school students is a key strategy for increasing the survival rate of patients with out-of-hospital cardiac arrest [23–25]. The appropriate age for training is determined by considering a child's cognitive ability and physical development. In Korea, CPR training is mandatory under the School Health Act and primarily targets upper elementary school stu-

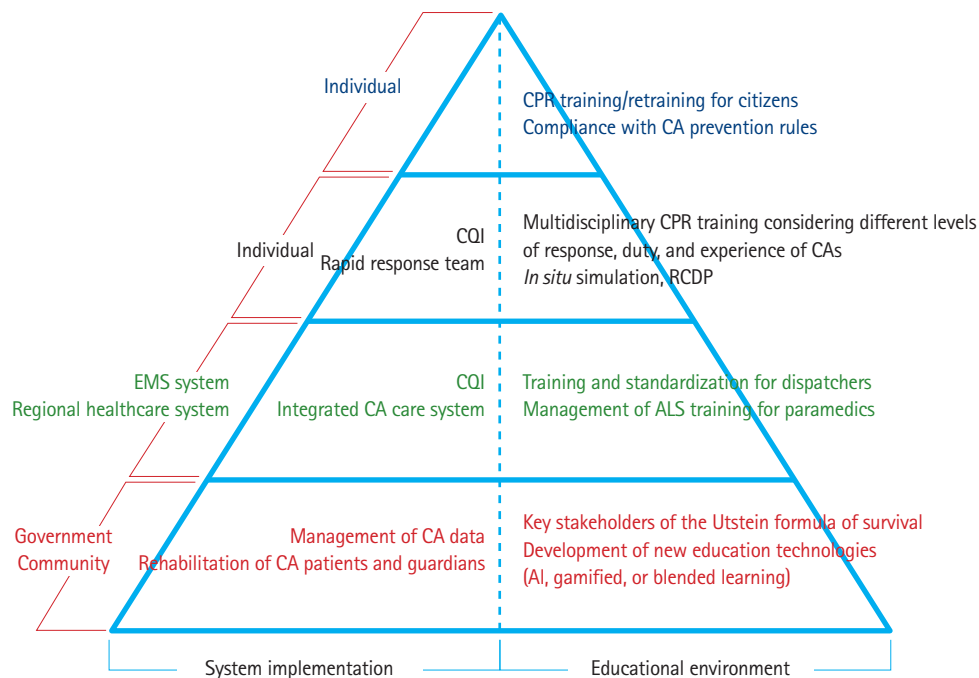


Fig. 2. Core pyramid of education and system implementation for enhanced chain of survival in Korea. CPR, cardiopulmonary resuscitation; CA, cardiac arrest; CQI, continuous quality improvement; RCDP, rapid cycle deliberate practice; EMS, emergency medical services; ALS, advanced life support; AI, artificial intelligence.

dents (ages 10–12 years). This is because children around age 10 years begin to develop the physical strength to achieve the minimum chest compression depth required by adults and have sufficiently developed cognitive abilities to logically understand the CPR procedure (rapid recognition, call 119 [Korean emergency medical services number], and immediate compression). Therefore, the primary target for training in Korea is older students who can perform reporting and compression. Providing children under 12 years with CPR training through statutory first aid training is crucial for fostering confidence and willingness to perform CPR in the future. Chest compression may be physically challenging even in children under 9 years. However, recognizing the importance of reporting an emergency and providing rapid resuscitation has a positive effect by fostering social responsibility and emergency response skill socialization.

Europe and the United States are expanding education for older elementary school students. The European Resuscitation Council prioritizes the cognitive preparedness of children aged ≥ 9 years, emphasizing the long-term benefits of early education in lowering psychological barriers (fear) to cardiac arrest. Furthermore, performing only chest compression (hands-only CPR) is feasible even for those with limited physical strength. Additionally, the American Heart Association recommends hands-only CPR training, as children aged approximately 12 years can perform hands-only CPR at a rate and depth sufficient to contribute to survival. Skills acquired at this age are retained long-term into adulthood as a key rationale for expanding the age range. A global trend is to increase the number of potential rescuers by expanding education to cognitively prepared children aged 9–10 years and older, even if they have physical limitations.

Addressing disparities in CPR education for laypersons

Low CPR training rates among the general public remain a barrier in community learning, and public consensus is needed to address these issues [26,27]. Continued attention and social contribution projects are required to develop diverse educational content for special needs groups and address multicultural families and language barriers.

CPR training for women focuses on addressing disparities in chest compression skills and gender-related psychological barriers. The low rate of bystander CPR for female patients is attributed to psychological barriers, such as sexual misunderstandings and hesitation about exposure [28]. Training should clearly explain the essential importance of compression to female patients and emphasize legal protections under the Good Rescuer Act. The 2025 guidelines emphasize the ability to perform compression

and attach AED without removing underwear, encouraging participants to act without hesitation.

Training for older adults focuses on the physical limitations and memory retention they may face as rescuers. Older adults often struggle to maintain high-quality CPR in a standard position for extended periods due to muscle weakness and joint problems. Therefore, training focuses solely on hands-only CPR to reduce technical burden and minimize physical fatigue through frequent, short, and repetitive training sessions. Training environments can be customized to the needs of older adults, such as using height-adjustable mannequins or training on a table. Considering the difficulty of retaining new information, the training content should be simplified to focus on core procedures (calling 119 and chest compression). Repeated training with auditory feedback devices (a metronome) can help students remember the compression rate.

Bystander CPR rates are low among vulnerable populations due to limited access to CPR training. Therefore, Europe and the United States are expanding community-based training programs that deliver training in easily accessible locations [29]. Multilingual instructors and interpreters are available to immigrant and multicultural families, and multilingual support is provided to translate and adapt training materials to diverse languages and cultural contexts. Because certain cultures may have taboos against physical contact with others or cultural barriers, we are attempting a tailored approach, starting with family and friends, to reduce concerns about physical contact. Therefore, domestic educational programs should be developed with flexibility in mind, considering cross-cultural differences.

Enhancing flexibility and accessibility for individuals with disabilities

Efforts are being made to improve the flexibility and accessibility of CPR training guidelines not only in Korea but also globally, including the United States and Europe, to enable persons with disabilities to contribute to the chain of survival as bystander rescuers. In Korea, a pilot training program for people with disabilities, conducted as part of a social contribution project led by the Korean Cardiopulmonary Resuscitation Association, focuses on reducing the physical limitations associated with rescue breathing and mouth-to-mouth contact by recommending chest compression (hands-only CPR) as the primary method. For those who cannot adopt the standard position due to physical disabilities, flexible training is provided, including sitting or other compression positions. Furthermore, the instructor-to-trainee ratio is flexibly adjusted.

The American Heart Association has developed a program that awards "Advisor" certification to individuals with disabilities who have difficulty performing CPR. This program allows individuals with disabilities to contribute to the chain of survival by acting as leaders in rescue situations [24]. Additionally, Europe and the United States ensure physical accessibility in the training environment and use adaptive training tools for the visually impaired [30].

EDUCATIONAL STRATEGIES TO ENHANCE WILLINGNESS TO PERFORM CPR

Strategies to overcome barriers to bystander CPR

Shifts in CPR education paradigm by major periods

Rapid, high-quality CPR provided within the first 4 to 5 minutes

after cardiac arrest is one of the most important factors for improving survival. CPR education systematically expanded after the 2005 amendment to the Emergency Medical Service Act. A major turning point occurred in 2013 with the mandate for CPR training in schools. All elementary, middle, and high school students are required to receive CPR training, and all faculty members are required to complete training (Table 1, Fig. 3). Accordingly, the ranking of the main CPR education access routes in Korea was military services (34.8%), workplaces (13.1%), and firefighting and emergency medical services (12.6%) in 2009 [12] and workplaces (43.5%), military and government agencies (37.8%), and schools (29.1%) in 2024, with schools establishing themselves as the core of domestic CPR education [31].

Table 1. Educational strategies and evolution of CPR training paradigms in Korea

Era	Focus	Key strategic element
2000s	The "dormant era" (focus on healthcare professionals) Professionalism	Restricted to healthcare providers Low public involvement
Early 2010s	The "expansion era" (institutional mandates) Institutionalization Mass training	Mandatory school/workplace training In 2013, CPR training became mandatory within school health education for students and teachers
Late 2010s	The "advancement era" (hands-on competency) Practicality	Hands-on simulation Four-step standardization The "four-step life-saving action (check, call, compress, and shock)"
2020s	Digitalization Voluntarism	Tech integration High public motivation
Current (2024–)	Community resilience	The number of certified trainees has reached an all-time high, with a focus on community resilience and rehabilitation

CPR, cardiopulmonary resuscitation.

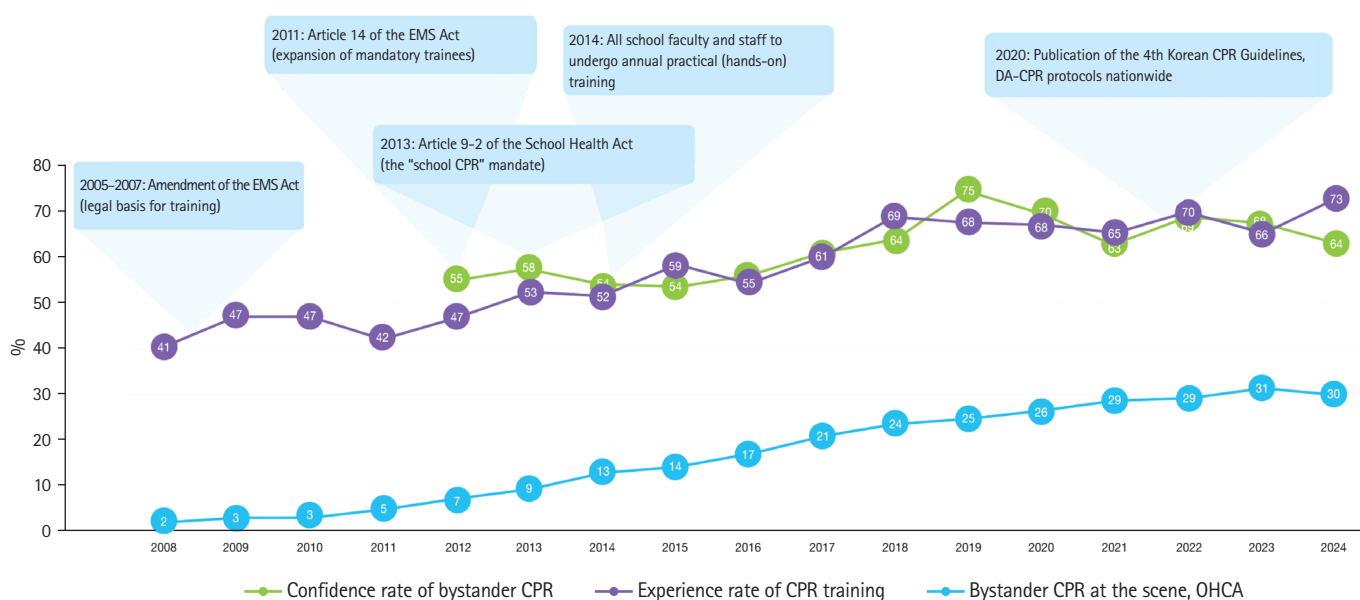


Fig. 3. Evolution of cardiopulmonary resuscitation (CPR) training policies and public training in Korea. EMS, emergency medical services; DA-CPR, dispatcher-assisted cardiopulmonary resuscitation; OHCA, out-of-hospital cardiac arrest.

Stagnant layperson CPR rates

The rate of bystander CPR performed on patients with out-of-hospital cardiac arrest is increasing, from 1.9% in 2008 to 12.9% in 2014, 16.8% in 2016, 29% in 2022, and 30% in 2024. However, this rate remains low compared with the 39 to 43.6% rate observed in high-income countries [32,33]. Moreover, the bystander CPR rate has stagnated at less than 30% since 2021 (Fig. 3). Therefore, various policies and expanded education are required to increase the stagnant training rate. In particular, social integration and awareness of imbalances in CPR training are essential. The low rates of CPR training among the general public remain barriers to community participation, and public discussion is necessary to address these issues. In addition to ongoing interest and social contribution projects to address issues related to multicultural families and language barriers, the development of diverse educational content for groups with special educational needs is essential.

Barriers to CPR implementation and mitigation strategies

A complex mix of fears of harming the patient, lack of confidence, and the potential for legal liability are the primary factors that discourage laypersons from attempting CPR even when witnessing a cardiac arrest [26,34,35]. Multifaceted societal efforts and consensus are required to overcome these barriers. Effective education and public awareness of the Good Samaritan law should be provided to alleviate concerns about legal liability. Furthermore, CPR training should include education on the potential and impact of psychological barriers, and trainees should be trained through repeated practice or simulations to skillfully overcome and cope with stressful situations.

Strategies for increasing AED attachment rates

Laypersons may perceive AEDs as difficult to use due to the risk of electric shock or the complexity and specialized nature of the medical device. However, AEDs are safe for both users and patients, have few side effects, and are very simple to use. Furthermore, the likelihood of unnecessary defibrillation due to user error is extremely low, and most people can use it with very brief training [36].

Paradigm shift in AED policy and education

The legal environment for public access defibrillation (PAD) has stabilized since the 2007 legal mandates for AED installation in public facilities and the introduction of liability exemptions. The 2007 revision of the Emergency Medical Services Act mandated the installation of AEDs in numerous public facilities, apartment

complexes, and multiuse facilities. This exemption from liability for damage resulting from good faith first aid established a legal environment for the use of AEDs by the general public. The obligation to manage and install emergency equipment, including AEDs, was strengthened from 2016 to 2018. By 2022, the mandatory installation requirement was expanded to include workplaces with ≥ 300 employees. Furthermore, since 2012, the Korean Cardiopulmonary Resuscitation Association, the Korea Centers for Disease Control and Prevention, and the Korean Ministry of Health and Welfare have jointly included AEDs in the standard CPR training program for laypersons. In 2015, AED training was strengthened. The AED training completion rate was 0.5% when the system was first introduced in 2007 and increased from 8% in 2011 to 24.5% in 2015, 40% in 2020, and 36.2% in 2024 (Fig. 4) [37]. As the target of mandatory installation expanded, the awareness of installation locations increased from 41% in 2022 to 50% in 2024. Currently, AED use is included as a core part of CPR training for the general public due to the expansion of permanent training by local governments and public health centers, and the training experience rate remains approximately 50%.

Disparity between AED training rates and actual rates of AED use by the general public

Despite the high rate of AED training completion by the general public, prehospital AED use is still primarily performed by 119 emergency responders. The actual rate of on-site AED use by the general public remains in the 2% range. This rate differs significantly from the rates of PAD use by the general public in the United States and Japan [38,39]. The reasons for this are a lack of confidence in using the machine and unfamiliarity with its use, not knowing where it is and not being able to retrieve it even when an actual cardiac arrest occurs, and fear of using it incorrectly. Even when an AED is installed, people do not use it due to "not knowing where it is," physical accessibility limitations, psychological barriers, and training effectiveness issues. AED training should be transformed into context-based training that enhances actual field response capabilities (Table 2).

DEVELOPMENT, IMPLEMENTATION, AND EVALUATION OF EFFECTIVE CPR PROGRAMS

Diversified resuscitation training systems for healthcare providers

Resuscitation-related organizations, emergency medical services, and local communities should monitor exposure to and retraining in out-of-hospital and in-hospital cardiac arrest training through

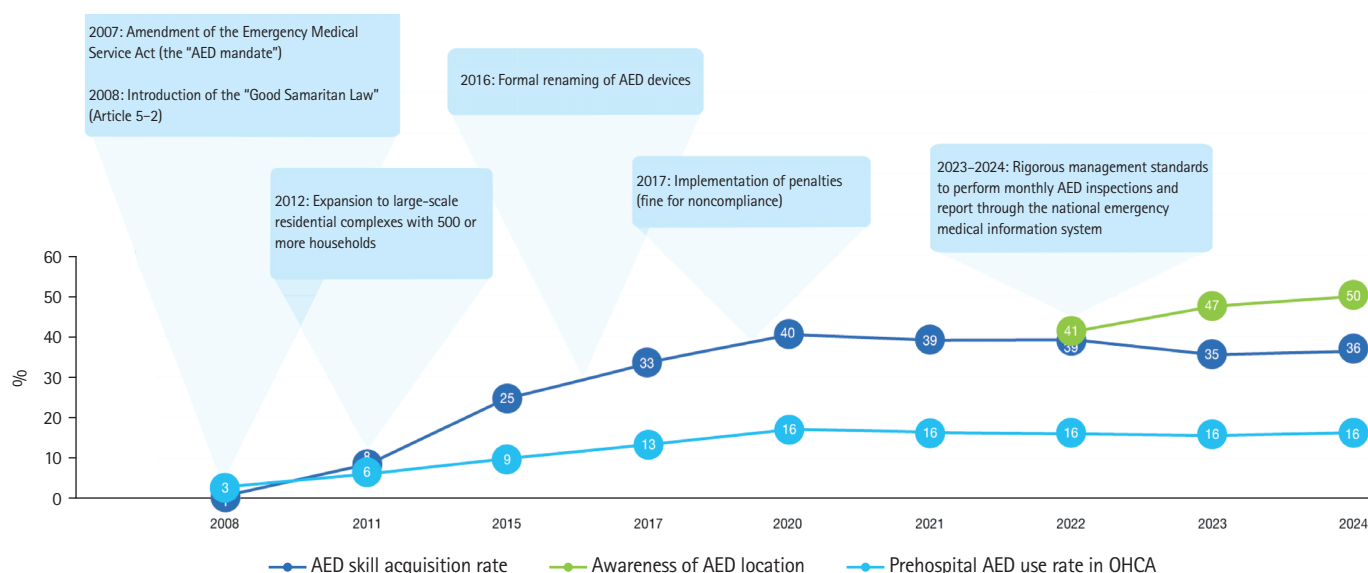


Fig. 4. Evolution of automated external defibrillator (AED) policies and public training in Korea. OHCA, out-of-hospital cardiac arrest.

Table 2. Analysis for decoupling the low public AED utilization rate despite high training coverage in Korea

Factor category	Key element	Impact level	Strategic recommendation
Psychological barrier	Fear of litigation and "doing it wrong"	High	Good Samaritan law (Article 5-2 of the Emergency Medical Service Act)
Physical/spatial	Limited 24/7 access and hidden locations	High	Advocate for outdoor accessibility, such as 24/7 accessible outdoor cabinets
Educational	Lack of realistic simulation and confidence	Medium	Shift to simulation: from "how to use" to "how to act"
Systemic	Need for better dispatcher-assisted guidance	Medium	Context-based simulation
Legal framework	Strong mandatory regulation (top-down)	Medium	Real-time guidance: dispatchers provide precise instructions on the nearest AED location during the 119 ^{a)} call
			Community-based (bottom-up)

AED, automated external defibrillator.

^{a)}Korean emergency medical services number.

an integrated system, develop and disseminate resuscitation curricula, strengthen the resuscitation skills of laypersons and healthcare professionals, and tailor programs to the Korean healthcare environment to ensure immediate and practical CPR training in real *in situ* cardiac arrest situations.

Based on the target provider, accredited training courses are divided into public and healthcare professional courses. Courses are divided into prehospital basics for laypersons, hospital-level adult BLS and ALS, hospital-level pediatric ALS, and neonatal life support based on the cardiac arrest application. Training programs are developed and tailored to each function. Basic courses, including chest compression- and dispatcher-assisted CPR, are offered to laypersons and students, and CPR/AED advanced courses are offered to first responders. Before participating in ALS courses, trainees must possess a certain level of prior knowledge and skills acquired using computer self-study programs, previewing training materials and videos, and preassessment tests

(flipped learning). ALS courses must include an effective pre-course preparation phase, and only trainees who successfully complete this phase are permitted to participate.

The KALS course, developed in 2009, uses the training of in-hospital cardiac arrest simulation, which focuses on cardiac arrest scenarios and uses RCDP. The KALS-Experienced Provider program, a specialized course that includes unstable bradycardia, tachycardia, and in-hospital rapid response team activities, has been offered since 2021. This program can be implemented frequently due to its short duration, and the clear separation of skills and simulations allows for separate programs for hospital use. In 2021, the Korean Basic Life Support (KBLS) course was implemented, which strengthens *in situ* simulation training tailored to the domestic medical environment. As of 2025, the Korean Cardiopulmonary Resuscitation Association has continued to provide healthcare providers with certified resuscitation training, including basic and advanced life support for newborns and children

(Korean Neonatal Basic Life Support [KNBLS], Korean Pediatric Advanced Life Support [KPALS]), and adults (KBLS, KALS).

Having a CPR team member who has received ALS training increases the survival rate from in-hospital cardiac arrest [40–44]. Various training programs are provided for healthcare workers based on domestic medical laws, considering the frequency of cardiac arrest exposure and the scope of emergency treatment by multidisciplinary professionals.

Strengthening teamwork and leadership training

Direct evidence on the impact of teamwork and leadership training on patient outcomes is limited [45]. However, teamwork competency training significantly improves nontechnical skills and performance indicators, and these effects persist for a period after training [15,46–48]. Since no negative effects have been reported [49–51], all basic and advanced resuscitation training curricula should include teamwork competencies to enhance resuscitation team effectiveness [45,51].

Reconsidering the use of blended learning in existing resuscitation education

With the spread of novel infectious diseases like COVID-19 making face-to-face training difficult, blended learning (combining digital resources with hands-on practice) has been proposed as an alternative to resuscitation training. A systematic literature review found mixed results, with studies indicating that blended learning improves skill performance or offers benefits in terms of knowledge acquisition and cost savings [52–63]. Although knowledge acquisition is highly effective in ALS and trauma care training [64,65], its effects on skill performance have not been clearly demonstrated [66]. The blended learning methods are recommended specifically in settings where face-to-face training access is limited.

Gamified, virtual reality, and augmented reality learning

Given the infrequency of cardiac arrest situations and the difficulty of replacing them with alternatives, the 2020 guidelines introduced virtual reality and gamified learning through play using computer interfaces that simulate emergency situations or real-world environments [67]. However, gamified learning currently requires a comparative study with existing educational media [68–70], a sociopedagogical consensus and basis on appropriate educational content and methods for the media's properties, the definition and scope of gamified learning, and the exclusion of the novelty effect. The novelty effect refers to situations where learners find new technologies novel and naturally increase en-

gagement when using media, but this can hinder intrinsic motivation or prevent the achievement of educational goals. Smartphone-based games enhance knowledge and confidence [17,71], and training using leaderboards reduces the time required for core pediatric resuscitation actions, such as epinephrine administration [5,72,73]. However, most studies have very low levels of evidence, and generalized adaptations are difficult due to the heterogeneity of educational content and effectiveness measurement methods. Therefore, the current evidence base is insufficient to recommend gamified learning as a formal component of resuscitation training. Expanded research on skills, attitudes, and knowledge, as well as standardized reporting of educational effectiveness, is needed [17].

Effectiveness of RCDP

Traditional training feedback focuses on debriefing, whereas RCDP provides immediate feedback on performance and sufficient time for repeated practice to improve performance. This process is divided into stepwise learning stages [18] and is designed to ensure sufficient repetitive learning by gradually extending the learning stages [20,74–76]. This learning method has already been implemented in the KALS Provider program and will be maintained.

RCDP significantly reduces the time from cardiac arrest rhythm recognition to defibrillation and increases the probability of successful defibrillation within 3 minutes [18,77]. Furthermore, it improves the compression fraction [22] and reduces the preshock pause, thereby improving CPR quality [77]. It provides clinical benefits, including shortening drug administration time and improving performance scores of team leaders [19].

Compared with traditional debriefing, RCDP showed no significant differences in chest compression initiation time or skill retention or showed mixed results. Some reports have shown a higher rate of score decline in the RCDP group in terms of skill retention. Besides these mixed results, the evidence base of current research is limited. However, RCDP has demonstrated potential benefits, including reducing defibrillation preparation time and achieving high-quality CPR, making it a viable option for designing basic and ALS training. Further research targeting laypersons and first responders is needed.

Methods for improving resuscitation skills during training

Cognitive aids

Using cognitive aids is reasonable for in-hospital healthcare providers as it improves performance. However, they are not recommended for laypersons as they may delay CPR initiation.

Real-time feedback devices

Feedback devices have been recommended since 2015. Evidence has been continuously strengthened since 2020, and effectiveness verification has been added. Feedback devices increase the chest compression depth and the rate of achieving the appropriate compression rate recommended by the resuscitation guidelines. Therefore, we recommend using devices that directly provide feedback on chest compression rate, depth, relaxation, and hand position to improve CPR performance.

The use of "real-time" feedback devices in CPR training, such as metronomes and manikins with chest compression frequency and depth monitoring, enhances training effectiveness. The 2025 guidelines continue to emphasize their continued use. Skill performance significantly deteriorates regardless of the use of feedback devices 1 year after completing the training program. Although some studies have shown no difference in skill performance at the end of the training program [78–80], high-quality simulation studies supporting the use of feedback devices in CPR training have been added since 2015. Subsequent clinical research has shown that using feedback devices can improve CPR skills [79,81,82]. If feedback devices are unavailable, using devices that provide tonal feedback, such as music and a metronome, to improve chest compression rate can be helpful [83].

Post-simulation debriefing

Debriefing or post-simulation discussion is a structured learning experience in which two or more team members gather after a simulation training session to reflect, discuss, and provide feedback on the training content. Simulation-based resuscitation training is an important means of acquiring knowledge and understanding technical and nontechnical aspects, and debriefing is crucial for improving learning outcomes. Immediate debriefing (hot) after resuscitation and delayed debriefing (cold) several days later are applicable depending on the organization's resources and work schedule. Both methods are recommended to improve the prognosis of cardiac arrest survival [9–11].

Debriefing is the most important step in simulation training and is crucial for improving teamwork, leadership, and communication skills [84]. Therefore, debriefing should be mandatory in all CPR training, and structured post-CPR discussions are recommended even after the actual CPR experience. Evidence that post-CPR debriefing increases the likelihood of survival to discharge with favorable neurological outcomes in patients with in-hospital cardiac arrest is weak, and similar results have been found in patients with out-of-hospital cardiac arrest [85,86].

IMPORTANCE OF QUALITY IMPROVEMENT IN CPR TRAINING

Effective CPR training is crucial for maximizing the survival outcomes of patients with cardiac arrest. Furthermore, quality management of training programs requires continuous monitoring of existing programs to suggest improved training methods and ensure that trainees receive optimal CPR knowledge and skills. Not only providers and instructors but also the training committee faculty are key elements in CPR training. The faculty are trained to improve ongoing curriculum programs and develop continuous evaluation skills, thereby maximizing CPR training effectiveness.

In Korea, the Korean Cardiopulmonary Resuscitation Association and related academic societies are leading the development of curricula, strengthening the quality management of training institutions, and strengthening the core role of the training management center. The training sites must meet established standards for instructors, equipment, facilities, and adhere to operating regulations and program administration manuals to be accredited as a CPR training institution. Additionally, accredited training sites should operate an ongoing quality assurance program, requiring regular reaccreditation at appropriate intervals to ensure that accreditation standards are maintained.

DEVELOPMENT AND IMPLEMENTATION OF COMMUNITY-INTEGRATED RESUSCITATION GUIDELINES

Changes in prehospital policy and educational environment

The mandate for AED installation was significantly expanded in 2022 to include workplaces with > 300 full-time employees. The Korean Ministry of Health and Welfare continuously updates AED management guidelines to ensure operational readiness.

Telephone CPR and bystander impact

Given that bystander CPR increases survival by 2.4 times, the role of telephone CPR by emergency dispatchers has been reinforced to lower psychological barriers for laypersons.

Standardized programs

The 2022 Standardized CPR Program for Laypersons was deployed, offering CPR/AED general basic (80 minutes) and advanced courses (180 minutes) for first responders, including pediatric and infant CPR.

Social media and artificial intelligence integration

Social media platforms are powerful tools for conducting BLS campaigns [87]. To combat misinformation [88–91], we propose a standardized content framework and the adoption of generative artificial intelligence for content verification to ensure alignment with official guidelines [92].

Community data monitoring

Korea operates a robust national registry, the Korea Sudden Cardiac Arrest Survey Statistics [32], which is an essential approach for monitoring community-wide quality indicators and improving survival outcomes [93].

Competency of emergency medical system providers

High-quality CPR performed by emergency medical system providers is a major determinant of neurological outcomes [94–97]. We emphasize team-based simulation training using real-life cases and Smart Medical Direction to enhance paramedics' field experience [98,99].

Enhancing in-hospital survival chains*Rapid response systems*

The 2025 guidelines strongly recommend establishing a rapid response team. Although evidence for improved survival is still emerging, rapid response teams have shown a clear trend in reducing the incidence of in-hospital cardiac arrest [100,101].

Impact of certified ALS training

The completion of certified training is consistently associated with higher rates of spontaneous circulation return and survival. Certified ALS training is recommended for all in-hospital health-care providers, as even low-cost simulations can significantly reduce neonatal mortality [40–44].

Systemic enhancements

Mechanical CPR is not a routine replacement for manual CPR. Mechanical CPR devices are valuable during transport or specialized procedures to ensure consistent compression quality.

Strengthening CPR systems and capabilities in hospitals

Mechanical CPR devices can be used as an adjunct to maintain consistent compression depth and rate in specific surgical settings where medical staff safety or continuous manual compression is difficult [102–106]. Furthermore, with the widespread use of pads-type defibrillators, minimizing hands-off time (the time between chest compressions) before defibrillation is increasingly emphasized as an essential element of high-quality CPR.

Systematization and competency management of the Korean resuscitation training system

In the 2020 guidelines, the concept of "environment for survival in cardiac arrest" was introduced, and the education and implementation parts were included as independent chapters, laying the academic background for Korean CPR education. Accordingly, the association and related academic societies developed and distributed the KALS program in 2011 and the Korean BLS program in 2021. The revised programs enhance the effectiveness of CPR teamwork and role-sharing within hospitals by teaching the latest knowledge and skills and reinforcing *in situ* simulation training. Additionally, regular CPR training and performance assessments for all healthcare professionals have become mandatory requirements for medical institution accreditation, providing institutional support for healthcare professional competency management. Furthermore, the 2025 guidelines continue to recommend regular simulation-based education and training to maintain the proficiency of emergency medical personnel.

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Conflicts of interest

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Data availability

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