

## The Evidenced Based 2020 Cardiopulmonary Resuscitation Guidelines of Saudi Heart Association (Basic Life Support)

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### Abstract

International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations (CoSTR) is published by the International Liaison Committee on Resuscitation (ILCOR) every five years since 2000, considering review of cardiopulmonary resuscitation (CPR) science.

Seven task forces were assigned after 2015 CoSTR to review the emerging evidence and continuously evaluate them. Furthermore, CoSTR reviewed ILCOR with representatives from 7-member resuscitation organizations annually. However, in the year, 2020 CoSTRs were published on October 21, emphasizing the work of last five years. ILCOR addressed three different types of reviews for 2020 CoSTR. These types prioritized resuscitation community, new evidence available for previous review and resuscitation community based on the interest of the topics. Higher priority is possessed by the systematic reviews. Unique or updated evidence was mentioned in some CoSTR. Scoping reviews for some topics were conducted during this update. These efforts enable national, regional, and local resuscitation organizations and councils to develop their guidelines. Scientific evidence is considered as the primary source for the development of any guidelines, and the latter will be adjusted for national use.

Since then, the Saudi Heart Association (SHA) adapted the ILCOR guidelines published in October 2015, modified, and uploaded to the SHA CPR portal. It was also updated until 2018 publication, printed, and distributed to all CPR centers throughout Saudi Arabia.

An evidenced Based multidisciplinary team based work has been conducted with National CPR Committee at the Saudi Heart Association (SHA). Authors adapted the 2020 Guidelines in the Circulation Journal as per the ILCOR-CoSTR, published October 21, 2020. The 2020 guidelines and the previous reviews of 2015 were utilized to facilitate for the end-user easily comparison of the science progression. The new topics reviews would acknowledge according to the corresponded section. In Saudi Arabia, modification depends on the nation's needs. For instance, the sequence of ABC in children and infants were not changed to C-A-B because the most common cause of cardiac arrest among infants and children is respiratory in origin. Therefore, respiratory management should be taken place at the beginning of early childhood. Also, there was no evidence to support that the outcome of the C-A-B sequence is superior to that of the A-B-C sequence (all studies were manikin based, not RCTS ones).

**Keywords:** Cardiopulmonary Resuscitation Guidelines; Saudi Heart Association; Cardiopulmonary Resuscitation (CPR)

### Introduction

These guidelines guide techniques considered for cardiac arrest victims during the initial resuscitation. They include essential life support and an automated external defibrillator (AED). Moreover, it also has procedures used to manage foreign body airway obstruction and recovery position summary.

These guidelines covered an elaborative explanation of the techniques needed to provide advanced care through Emergency Medical Services (EMS) and in-hospital services to serve the adult and pediatric population.

The costs and potential confusion created by changing guidance from 2015 were considered by the writing group. Therefore, changes to those judged were limited to the important ones and supported by new evidence. They are based on the ILCOR-CoSTR 2020.

Saudi Heart Association Guidelines were formulated and reviewed by the writing group and national resuscitation committee members before final approval. SHA guidelines were confined to the people of KSA and to be applied on any infant, child or adult found unresponsive or choking.

### Methodology

(ILCOR) developed different Task Force for BLS, ACLS, PALS, NEONATAL, ACS, First Aid, and CPR training and educational strategy for reviewing PICO (population, intervention, comparator, and outcome) questions. The topics' questions are discussed by the task force, and they highlighted the revised ones as scope-view, evidence update, or systematic review. The systematic review was performed by the task force considering detailed exclusion and inclusion criteria and recommendations provided by the Institute of Medicine of the National Academies. The PICO flow followed the methodological method developed by the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Working Group. With the help of state of the art tools, reviewers created a reconciled risk-of-bias assessment for each of the questions and included studies: Cochrane for randomized controlled trials (RCTs), GRADE for observational studies that inform both therapy and prognosis questions, and Quality Assessment of Diagnostic Accuracy Studies (QUADAS) for studies of diagnostic accuracy. The critical outcomes of CPR were determined as the return of spontaneous circulation (ROSC; level 7), survival (level 8), and favorable neurological outcome (level 9). The outcomes at hospital discharge (30, 60, 180 days, or one year) were considered for neurologic outcome and survival. Process and physiologic endpoints were included as essential outcomes.

Regarding the methodology and the five core GRADE domains of risk of bias, inconsistency, indirectness, imprecision, and other considerations, categorization was done for the quality of the evidence as high, moderate, low, or exceptionally low. The consensus on science statements or written summary of evidence for each outcome was withdrawn from these evidence profile tables. After that, recommendations for consensus-based treatment were formulated, accompanied by a statement from the task force regarding preferences/values and an overall evaluation of the evidence. A strong recommendation typically was referred to using the words "we recommend," while a weak recommendation was referred to by "we suggest." We depend on some points and deferred other previously studied topics in formulating recommendations. We couldn't list the benefits and risks in each recommendation because we have a significant knowledge gap due to a lack of studies. Still, each recommendation listed is clear concise, with the level of grade and supporting evidence according to a systematic review done for this evidence.

ILCOR guideline was drafted and sent to an external reviewer before its final use. It reflects current research conducted over the last 35 years.

### Updating policy

SHA guidelines will be updated according to a further recommendation from ILCOR-CoSTR. The national CPR committee will annually study the emerging evidence related to resuscitation science and update the guidelines accordingly. These updates are applied after

evaluating the evidence and its applicability. The national CPR committee will review the feedback after implementing the guidelines nationwide and their applicability to the international consensus. We, “The national CPR committee,” are doing our best to be clear and specific for the recommendation and its application.

The latest guidelines were reviewed in June 2021 and updated accordingly. We, “The national CPR committee,” updated some policies and introduced the work of the national DNR task force.

### Basic life support (BLS)

In this review, an extensive literature search was performed, and the latest evidence about essential worldwide BLS diagnostics, interventions and prognostic factors for cardiac arrest victims were evaluated. The most critical lifesaving steps of BLS include:

1. Cardiac arrest prevention
2. Immediate diagnosis of cardiac arrest and emergency response system activation
3. Performing high-quality CPR initially with quick defibrillation of shockable rhythms.

The treatment recommendations in this Part are limited to adult victims of CPR.

The chain of survival described the events’ sequence associated with the survival of cardiac arrest victims.



The 2015 consensus concentrated on GRADE methodology referring to resuscitation quality, while the 2010 ILCOR Consensus on Science directed the guideline toward “what” in resuscitation. However, 2020 ILCOR CoSTR highlights categorizing the revised evidence as systematic review, evidence update, or scope review.

We hope that this body of knowledge of international consensus statements is translated and used by resuscitation committees and other stakeholders to build practical resuscitation guidelines.

### Early access and prevention of cardiac arrest

### Early access: Emergency medical dispatch

Emergency call is the first stance to communicate with emergency medical services (EMS). It is essential to diagnose cardiac arrest at an early stage because:

1. High-priority response is a requirement of proper dispatch,
2. Provision of telephone CPR instructions,
3. Community first responders arrived carrying AEDs.

A better outcome from cardiac arrest was ensured by the most cost-effective solution optimized EMS dispatch. This highlights the significance of dispatchers' improved ability to identify cardiac arrest and deliver telephone CRP instructions that improve outcomes.

### Cardiac arrest dispatcher recognition

#### ILCOR treatment recommendation

It is recommended that dispatchers identify an unconscious person breathing abnormally. Moreover, the victim was recommended to consider that they were in cardiac arrest at the time of call if in an unconscious state with either abnormal or no breathing (strong recommendation, very-low-quality evidence).

Dispatchers needed to be trained for identifying unconsciousness with abnormal breathing. Awareness should be given regarding recognizing agonal breaths across various clinical manifestations and presentations (strong recommendation, very low-quality evidence).

#### Dispatcher instructions in CPR (SysRev 2018)

#### ILCOR treatment recommendation (2018)

It is recommended systems in emergency medical dispatch centers should enable call handlers for providing CPR instructions for cardiac arrest adult victims (strong recommendation, very-low-quality evidence).

When needed, CPR instructions should be provided by emergency call takers for cardiac arrest patients of older age (strong recommendation, very low-certainty evidence).

#### SHA recommendation: 2018

The same recommendations as in the 2015 guidelines.

A special education program was recommended for EMS dispatchers, including civil defense, red crescent authorities, police dispatchers, etc. This was likely to facilitate effective communication between callers and call handlers providing CPR instructions about suspected OHCA or critical situations.

#### ILCOR treatment recommendation (2015)

It is recommended that CPR instruction about chest compression should be provided by dispatchers to callers for adults with suspected OHCA (strong recommendation, low-quality evidence).

### SHA recommendation: 2015

A specially tailored education program is recommended for dispatchers in EMS systems and individuals in the civil defense, red crescent authorities, police dispatchers, etc. This is likely to favor and enhance effective communication with callers and provide CPR and other instructions about suspected OHCA or crucial situations.

### Resuscitation care for suspected opioid-associated emergencies

#### ILCOR treatment recommendation

Naloxone addition to existing BLS practice guidelines, is not recommended for the BLS management of children and adults suspected respiratory or opioid-associated cardiac arrest in the pre-hospital setting.

#### Opioid overdose response education

#### ILCOR treatment recommendation

It is suggested that education regarding opioid overdose should be offered, without or with naloxone administration, for individuals at higher risk of opioid overdose in any setting (weak recommendation, very- low-quality evidence).

**SHA recommendation:** Including the opioid educational program in the first aid courses and other activities favoring national awareness programs is recommended.

### Drowning search and rescue

#### ILCOR treatment recommendations

It is recommended to use submersion duration as a prognostic indicator while deciding about surrounding rescue management operations (strong recommendation, moderate-quality evidence for prognostic significance).

It is suggested to utilize the patient's age, type of water, witness status, EMS response time, and water temperature while making prognostic decisions (weak recommendation, very low-quality evidence for prognostic significance).

It is essential to acknowledge consensus excluded rare and exceptional case reports identifying good outcomes after being submerged in cold water.

We acknowledge that this consensus excluded exceptional and rare case reports that identify good outcomes after prolonged submersion in icy cold water.

**SHA recommendation: The following recommendations were provided in line with ILCOR treatment**

#### Early high-quality CPR

Lives can be saved through early and high-quality CPR. The evidence about starting CPR and characteristics of chest compression is explained in this section. Chest compressions include depth, full release, correct position, minimized interruptions, pulse checking, ventilation, and compression-only CPR. The performance of high-quality CPR is checked based on the above-mentioned procedures. There is a limitation for treatment recommendations catering the adult patients only.

## Starting CPR

It is essential to deliver high-quality chest compressions early to increase the chance of ROSC and survival after suffering cardiac arrest. CPR should perform chest compression among adult cardiac arrest victims rather than delivering rescue breaths after opening airways.

### Recommendation regarding treatment

It is suggested that CPR is started with compression rather than ventilation (weak recommendation, very low-quality evidence).

**SHA recommendation:** It is recommended to initiate CPR with the CAB sequence in OHCA situations; whereas, there is increased effectiveness of ABC sequence inside the health care facilities.

### Chest compression-only CPR vs. conventional CPR

In Chain of Survival, Bystander CPR is considered an essential life-saver. Before the arrival of EMS, CPR can increase the chance of defibrillation use, improve survival, prevent VF/PVT development as a deterioration of asystole, and contribute to better preservation of brain and heart function.

### ILCOR treatment recommendations

It is recommended that all patients suffering cardiac arrest should undergo chest compressions (strong recommendation, very-low-quality evidence).

It is also suggested that individuals who have received training and are willing should provide rescue breaths to adult cardiac arrest patients (weak recommendation, very low-quality evidence).

**SHA recommendation:** Advance professional training is required for performing ventilation as it is a skillful procedure, whereas it is easy to learn chest compression. Therefore, ventilation should be provided with trained rescuers, whereas all cardiac arrest resuscitations can be delivered via chest compressions. There is a need to include laypersons and bystanders, and health care workers in the training of how to perform ventilation.

### CPR before defibrillation

#### Evidence summary

It is not beneficial to perform CPR of 90 to 180 seconds before defibrillation among unmonitored patients' initial rhythm of VF/PVT and OHCA compared to performing immediate defibrillation with CPR defibrillator equipment.

### ILCOR treatment recommendation

It is suggested to give a short CPR period during an unmonitored cardiac arrest until there is a defibrillator for analysis and defibrillation if needed.

**SHA recommendation:** As soon as the defibrillator is made available, it should be attached, and its operation should be initiated.

### Hand position during compressions

CPR effectiveness can be altered through proper hand position, which is among the components of chest compression.

### ILCOR treatment recommendation

It is suggested to perform chest compression on cardiac arrest adult individual's lower half sternum (weak recommendation, very low-quality evidence).

**SHA recommendation:** There will be no alteration in this recommendation, considering the previous guidelines. Hand position is performed on the sternum's lower half, and heels are placed 2 to 3 fingers above xiphisternum angle, while the hands below are placed on an imaginary line between the nipples. Moreover, Skill guide high fidelity manikins should be considered for skill training with hand position.

### Chest compression rate

The chest compression rate is determined by chest compressions over a minute during each continuous period (pauses are excluded). This rate is different from the total number of chest compression delivered in a minute (considering the interruptions).

### ILCOR treatment recommendation

A manual chest compression rate ranging between 100 and 120 per minute is recommended (strong recommendation, very low-quality evidence).

**SHA recommendation:** A compression rate between 100 and 120 per minute is recommended to be practiced. There is a need to include the practice of compression rate in training on high-fidelity manikins.

### Chest compression depth

#### ILCOR treatment recommendations

A chest compression depth of around 2 inches (5 cm) (strong recommendation, low-quality evidence) is recommended. In contrast, excessive chest compression depths (> 2.4 inches (6 cm)) should be avoided among average adults (strong recommendation, low-quality evidence) while performing manual CPR.

**SHA recommendation:** The practice of chest compression depth between 4.5 and 5.5 cm is recommended among adult victims as individuals in Saudi Arabia are from multi-national origins.

### Chest wall recoil

#### ILCOR treatment recommendation

It is suggested to perform manual CPR by the rescuers who avoid leaning on the chest between compressions, which allow the chest wall's full recoil (strong recommendation, very low-quality evidence).

**SHA recommendation:** There is no change recommended in the current practice.

### Minimizing pauses in chest compressions

#### ILCOR treatment recommendations

It is suggested that the interruption of chest compressions should be kept < 10 seconds for delivery of 2 breaths to an adult victim given CPR with no advanced airway (weak recommendation, low-quality evidence).



It is recommended to keep the pre-and post-shock pauses short in chest compression. Further, pre-shock pauses are suggested to be as short as 10 seconds for manual defibrillation (strong recommendation, low-quality evidence).

It is suggested that chest compression fraction (total CPR time devoted to compressions) should be not less than 60% of total CPR time during conventional CPR (weak recommendation, low-quality evidence).

**SHA recommendation:** There is no change recommended in the current practice.

#### Compression-ventilation ratio

##### ILCOR treatment recommendation

A ratio of 30:2 is recommended for compression ventilation (weak recommendation, low-quality evidence).

**SHA recommendation:** There is no change of recommendation in the current practice.

#### Timing of CPR cycles

##### ILCOR treatment recommendation

It is suggested that cardiac rhythm be assessed by pausing chest compression every 2 minutes (weak recommendation, low-quality evidence).

**SHA recommendation:** There is no change of recommendation in the current practice.

#### Check for circulation during BLS

##### Treatment recommendation

The data is insufficient while performing CPR around the pulse value outside the ALS environment, where invasive monitoring is used. Therefore, pulse checking is not recommended.

**SHA recommendation:** It is suggested that compression effectiveness could be indicated by waves produced by compression if the patient is attached to a non-invasive cardiac monitor. Therefore, no direct pulse checking is supported during CPR.

#### Feedback for CPR quality

##### ILCOR treatment recommendation

The use of prompt devices and real-time audiovisual feedback is suggested while performing CPR as a part of a comprehensive system to treat cardiac arrest victims (weak recommendation, very-low-quality evidence); however, it is not done in isolation, and it is not part of a comprehensive system) (weak recommendation, very low-quality evidence).

**SHA recommendation:** There is no change of recommendation in the current practice.

#### EMS chest compression-only versus conventional CPR

Considering several perspectives, the treatment provided to OHCA patients was critical and complex. There were increased variability in the availability of the resource (number of rescuers, evidence-based protocols, equipment, and quality improvement programs) and the



EMS system. Logistically, OHCA patients' initial EMS care included various concurrent goals with complex interactions of patient assessment, scene safety, communication, patient care, transport, and extrication. Clinically, inpatient and arrest location variability in urban, rural, and remote patient settings with variable rates of bystander, AED and CPR availability and unpredictable and diverse environments.

#### **ILCOR treatment recommendation**

It is suggested to use a bundle of care that is a reasonable alternative to conventional CPR for OHCA. It was adopted in EMS with minimal interruption in cardiac resuscitation (weak recommendation, very low-quality evidence).

**SHA recommendation:** There was no change of recommendation in the current practice. The main focus was on the efficient and effective rule of the EMS system.

#### **Passive ventilation technique**

##### **ILCOR treatment recommendation**

The use of passive ventilation techniques were not suggested during conventional CPR (weak recommendation, very low-quality evidence).

The adoption of bundles of care was suggested in the EMS system, which involved continuous chest compression. Moreover, performing passive ventilation techniques was considered part of care bundles in treating OHCA (weak recommendation, very low-quality evidence).

**SHA recommendation:** There was no changes of recommendation in the current practice.

#### **Harm from CPR to victims not in cardiac arrest**

Evaluations were conducted for the harm caused by performing CPR on individuals not suffering from cardiac arrest. The rescuers were highly concerned about delivering chest compressions to a healthy individual (who has not suffered from cardiac arrest) because it might lead to severe consequences. Therefore, the rescuers showed reluctance in initiating CPR, even on a cardiac arrest patient.

##### **ILCOR treatment recommendation**

It was recommended that the laypersons initiate CPR for presumed cardiac arrest without harming patients who did not suffer from cardiac arrest (strong recommendation, very low-quality evidence).

**SHA recommendation:** There is no change recommended in the current practice.

#### **Risk of COVID-19 infection to rescuers from cardiac arrest patients**

##### **ILCOR treatment recommendation (2019)**

It was suggested that cardiopulmonary resuscitation and chest compressions can generate aerosols (weak recommendation, very low certainty evidence).

It is suggested that public access defibrillation and chest compressions are considered by the lay rescuers in the current COVID-19 pandemic situation (good practice statement).

It is suggested that rescue breaths are likely to be provided by trained and willing laypersons to infants/children, along with chest compressions (good practice statement).

It is suggested that personal protective equipment should be used by the health-care personnel in the current COVID-19 pandemic situation for procedures in which aerosols generate during resuscitation (weak recommendation, very low certainty evidence).

It is suggested that defibrillation should be considered by the health-care personnel before donning personal protective equipment for procedures generating aerosols. This is usually taken care of when benefits are likely to exceed the risk factors (good practice statement).

### Early defibrillation

This section mainly discusses; the complex choreography of care required to ensure high-quality, effective defibrillation and CPR; and evidence highlighting the clinical benefit of AEDs by health-care providers and laypeople in the OHCA setting. The major focus is on rapid defibrillation as the treatment chosen for VF/PVT in the OHCA and hospitalized settings.

### Public-access defibrillation

#### ILCOR treatment recommendation

It is recommended to implement public-access defibrillation programs for OHCA patients (strong recommendation, low-quality evidence).

**SHA recommendation:** Such recommendations should be implemented with a significant focus on managing the safety of constructed trade and industrial buildings.

#### Anticipatory defibrillator charging (2020 ScopRev)

#### ILCOR treatment recommendations: (2020)

There was no recommendation given for the absence of sufficient evidence on treating defibrillator charging.

**SHA guideline 2020:** (Current practice needed no change as there is no evidence to support pausing the chest compression for analysis of rhythm or continue chest compression and charge the defibrillator till the end of compression cycle then analyze and give shock).

#### Double sequential defibrillation (2020 SysRev)

#### The rationale for review

Double Sequential Defibrillation is a new topic considering the increased use of double (dual) sequential defibrillation (DSD). After around three shocks, > 20% of patients will remain in a shockable rhythm with VF/pVT. The survival rate decreases as there is an increase in the number of required defibrillation attempts. It is suggested to use DSD or two defibrillators for delivering two rapid sequential shocks or two overlapping shocks, one with standard pad placement and the other with either anterolateral or anteroposterior pad placement, as the mean to increase VF termination rate.

#### ILCOR treatment recommendation: (2020 SysRev)

It is suggested that the DSD strategy should not be used in routine cardiac arrest with a shockable rhythm compared to the standard defibrillation strategy (weak recommendation, very low-certainty evidence).

**SHA guidelines: (2020)**

The current practice of standard defibrillation strategy will be kept for cardiac arrest with shockable rhythm (first shock once defibrillator available then drug then shock, and to repeat sequence every 3 - 5 minutes).

**Automated external defibrillator vs manual defibrillator (EvdUp)**

**ILCOR treatment recommendation: (2020 EvdUp)**

There has been no change in the recommended treatment since 2010.

There was no difference between defibrillation in manual and semiautomatic reported during in- and out- hospital CPR. However, there is an increased preference for semiautomatic mode because it is user-friendly and delivers few inappropriate shocks.

Defibrillation is delivered in manual mode by the trained person. Chest compressions can be continued during charging with manual mode, which further minimizes the pre-shock pause. There is increased importance of frequent training and recognizing ECG while using a defibrillator in manual mode.

System of care, training skills, recognizing ECG affect the defibrillation mode giving the best outcome.

**SHA guidelines: (2020)**

We will keep with the same guidelines stated in 2010, which support ILCOR recommendations.

**Waveform analysis to predict successful defibrillation (EvdUp)**

**ILCOR treatment recommendation: (2020)**

There has been no change in the recommended treatment since 2010.

The evidence supporting the routine use of VF waveform analysis is limited for changing defibrillation management in adult cardiac arrest out- or in-hospital.

**SHA guidelines: (2020)**

We will keep with the current practice and 2010 guidelines which support the ILCOR recommendation.

**Rhythm check timing**

**ILCOR treatment recommendation: (2015)**

It is suggested that chest compression should be immediately resumed after shock delivery for adult cardiac arrest victims in any setting (weak recommendation, very low-quality evidence).

The chest compressions can be paused briefly for rhythm analysis in case of noticing a change in physiologic evidence of ROSC (rapid rise in ETCO<sub>2</sub> or arterial waveform).

**SHA recommendation:** (2015) (we recommend no change in the current practice).

### Analysis of rhythm during chest compression

#### ILCOR treatment recommendations: (2015)

It is suggested that artifact-filtering algorithms should not be used to analyze electrocardiographic rhythm during CPR apart from being used as part of research activity.

It is suggested to continue using EMS systems integrated with artifact-filtering algorithms clinically.

**SHA recommendation: (2015), we recommend to no change in the current practice [1-5].**

### Conclusion

Cardiopulmonary resuscitation is a rapidly revolving process. Saudi Heart Association adapted the ILCOR guidelines to keep the health care professionals practicing in Saudi Arabia familiar with the latest advancement in CPR. The national CPR committee adapted, modified, and uploaded the latest recommendations to the SHA CPR portal and distributed them to all CPR centers throughout the Kingdom. The new topic reviews will be mentioned according to the corresponded section of CPR, followed by SHA modification matching the national need.

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