

2021-22

# MANUAL OF BASIC LIFE SUPPORT

Department of Medical Education  
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# BLS



## Basic Life Support

## Preface to 2021 Edition

BLS workshop has been successfully running at Fatima Jinnah Medical College/University Lahore since 2012 and more than 3000 undergraduate students have been trained. Initial work by Professor Aamer Zaman Khan in writing and compiling the first edition of this book and successfully implementing the workshop at FJMU as the then Director of Department of Education of Fatima Jinnah Medical College has now progressed to one of the established learning opportunities offered by Fatima Jinnah Medical University. Continued perseverance of Professor Aamer Zaman Khan as Vice Chancellor of the university in maintaining the standards of BLS training at FJMU at par with international standards played a pivotal role in keeping this book and the workshop format updated according to international guidelines and practices.

The beneficiaries of this book and workshop include medical students, nursing students and allied healthcare workers. The book and hands on training provide a unique opportunity to participants for learning the scientific and philosophical basis of skills required for successful resuscitation of a person in cardiac arrest. Every attempt is made to keep the book updated and incorporate necessary modifications in skills training according to currently recommended guidelines by the American Heart Association (AHA). By and large, the book and the workshop format are adopted from the "American Heart Association (AHA) Guidelines and Recommendations," to keep the quality at par with international standards. Hence it is to acknowledge that various algorithms and skills included in this book and taught in the course are based on AHA Basic Life Support Course®.

The book was last revised by me as Director of Medical Education, Fatima Jinnah Medical University in 2016 following 2015 AHA Recommendation. This 2021-22 edition is a complete revision of previous editions of the book and is almost completely rewritten. For uniformity in learning standards and training, I have made every effort to keep the information presented in this edition aligned with 2020 AHA recommendations by including AHA BLS® Guidelines, Algorithms and Skills testing checklists. New sessions on AHA algorithms on CPR in Pregnancy, Neonatal resuscitation, Termination of Resuscitation, Opioid overdose, and BLS in COVID-19 suspected or confirmed patients have been included. Updated information on adult and pediatric chains of survival, compression techniques in infants, use of AED in pediatric age group, choking, rescue breathing, and recovery have been incorporated. Furthermore, Appendices at the end include AHA BLS® Skill Testing Checklists, in Adults, Child and Infant victims. I am sure that readers will find this new edition a concise, updated, and comprehensive addition to their learning armamentarium.

### **Professor Kamran Khalid**

Chairperson Department of Surgery  
Director BLS Workshop  
Fatima Jinnah Medical University Lahore



## Preface to 2016 Edition

Health data compiled from more than 190 countries shows that heart disease remains the No. 1 global cause of death with 17.3 million deaths each year and the number is expected to rise to more than 23.6 million by 2030, according to a report from the American Heart Association (AHA). Pakistani population has one of the highest risks of coronary heart disease (CHD) in the world and 30 to 40 per cent of all deaths in Pakistan are due to cardiovascular diseases (CVD). The CHD deaths in Pakistan has reached about 200,000 per year that is 410/100,000 of the population.

Cardiopulmonary resuscitation (CPR) is a lifesaving technique for victims of sudden cardiac arrest. Basic Life Support (BLS) is the foundation for saving lives after cardiac arrest and remains a critical factor in determining the outcomes. AHA recommendations for adult basic life support incorporate the most recently published scientific evidence and serve as the basis for education and training for healthcare providers and laypeople who perform cardiopulmonary resuscitation. The BLS course teaches learners to promptly recognize several life-threatening emergencies, give high-quality chest compressions, deliver appropriate ventilations, and provide early use of an AED. It includes adult, child, and infant rescue techniques. The course focuses on training the rescuers essential skills to perform high-quality CPR in a wide variety of settings. Basic Life Support includes both prompt recognition and immediate support of ventilation and circulation in case of respiratory or cardiac arrest. It has a combination of skills including mouth-to-mouth breathing to support ventilation and chest compression to maintain blood circulation to the brain and vital organs in case of sudden cardiopulmonary arrest. Knowledge of BLS and practice of simple CPR techniques ensures the survival of the patient long enough till experienced medical help arrives and in most cases is itself sufficient for survival. The awareness and training of BLS to the medical personnel is a pre-requisite for entering in the field and there is ample evidence to suggest that professionally trained undergraduates and health care providers are better able to manage medical emergencies during their real-life practice.

Taking everything in consideration we believe that an adequate education and training in first aid and basic life support is an essential part of undergraduate medical curriculum. The BLS course design and training at FJMU is based on AHA 2015 Guidelines. Department of Medical Education is highly indebted to all the instructors and support staff for their continued commitment, dedication and contribution towards achieving this highly important task.

**Professor Kamran Khalid**  
Director  
Department of Medical Education  
Fatima Jinnah Medical University

## Preface to 2012 Edition

Basic life support (BLS) is the level of medical care which is used for patients with life-threatening illnesses or injuries until the patient can be given full medical care at a hospital. It can be provided by trained medical personnel, emergency medical technicians, paramedics, and by laypersons who have received BLS training. BLS is generally used in the pre-hospital setting, and can be provided without medical equipment. Understanding BLS courses and more than that, practicing these techniques is by far the most challenging task confronting first aid. Taking everything into consideration, we believe that an adequate education in first aid and basic life support should be considered an essential aspect of the medical curriculum.

I have received much help from several sources and greatly acknowledge my debt to many friends and colleagues. I was also very fortunate to call upon a number of people to provide us with information to fill some of the gaps.

I would like to acknowledge the dedication and hard work of Prof. Dr. Rakhshanda Rehman Principal Fatima Jinnah Medical College for her guidance in the preparation of this hand book. My special thanks are due to our contributors Dr. Naheed Ali Hashmat and Dr. Syed Zia Haider who spared no efforts in making our dreams come true in the form of this hand book. I express heartfelt gratitude to Dr. Shabbir Chohan, Dr. Ammara Rabbani and Dr. Saif-ur-Rehman for their contribution in the preparation of this handbook. Last but not the least the exceptional contribution from Dr. Mariam Fatima, Dr. Fahad Nazir, Dr. Wajeha Anjum and Dr. Khaula Shamim is worth mentioning. I am grateful for their hard work and willing co-operation.

To those whose names, I have inadvertently omitted, I offer my apologies and hope that they will be consoled by the fact that a part of their knowledge and experience is being passed on to others.

**Prof. Dr. Muhammad Aamer Zaman Khan**  
Director, Department of Medical Education  
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## OVERVIEW

Cardiac arrest is defined as sudden cessation of cardiac activity making the victim unresponsive, with no normal breathing and no signs of circulation. Most common cause of cardiac arrest in adults remains a primary cardiac event leading to ventricular fibrillation. However, pediatric cardiac arrest is most frequently an end result of progressive respiratory failure, shock or combination of both. Estimated incidence of out of hospital cardiac arrest among adults in the U.S. is 347,322 and 7,037 in pediatric population.<sup>1</sup> Early recognition and initiation of cardio-pulmonary resuscitation (CPR) are crucial for survival from cardiac arrest. Reported prevalence of CPR training in the U.S. is currently 18%. Following successful resuscitation, the survivors experience various medical problems, including impaired consciousness and cognitive deficits and up to 18% of out of hospital cardiac arrest survivors suffer moderate to severe functional impairment at discharge from hospital.<sup>1</sup> Over 80 % of the burden of cardiac diseases is reported to be in low and middle income countries.<sup>2</sup> A recent multicenter report from Karachi described zero percent survival rate for patients with cardiac arrest two months after the event, less than 2 % survival rate at the end of stay in the emergency department and less than 1 % survival at discharge from hospital. Bystander CPR was only rarely done, resulting in significant delays in the first attempted CPR. Ambulances equipped with life-support interventions provided more pre-hospital CPR (70.4 %) with significantly shorter median time to first CPR and a higher likelihood of surviving to hospital admission compared to any other emergency transport method.<sup>2</sup>

Basic life support (BLS) encompasses recognition of signs of sudden cardiac arrest, stroke, and foreign body airway obstruction, followed by prompt activation of emergency response system and performance of high-quality CPR including defibrillation with an automated external defibrillator (AED). This requires skills to sustain circulation with effective chest compressions, maintain a patent airway, provide mouth-to-mouth or bag-to mouth breathing and use of AED to treat cardiac arrest until experienced life support services become available. Learning BLS skills and providing high quality CPR increase the chances of survival of the patient until arrival of advanced medical help and may be sufficient for survival in itself.

Hence it is important that those who may be present at the scene of a cardiac arrest, particularly lay bystanders, have knowledge and ability to use appropriate BLS skills. Health care professionals including medical students, can transfer CPR skills to others after they themselves have been appropriately taught and trained. Therefore, it is crucial that everyone in the medical field must learn the BLS. In 2019, Pakistan Medical & Dental Council (PMC) made BLS certification mandatory during the house job (<https://www.uhs.edu.pk/mcat/pmdcregulations30052019.pdf>). Recent studies

reported that whereas the attitude of doctors towards CPR is positive, the knowledge and practice of CPR is not satisfactory.<sup>3,4</sup> It will be prudent that BLS courses should not just be made mandatory for all health care professionals, but it is also important that regular reinforcement workshops and renewal of training certification be ensured to update the BLS scientific knowledge and reinforce the skills throughout their career. This is recommended that PMC ensure attending a refresher course at least once in 2 years and require evidence of re-certification upon renewal of PMC registration.

This updated booklet provides essential updated information based on 2020 AHA Recommendations and Guidelines on learning and training of BLS skills.<sup>1</sup> The workshop provides ample opportunity to undergraduate medical, dental and nursing students to learn, and practice updated and evidence-based BLS knowledge and skills according to American Heart Association (AHA) recommendations and standards.

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## INTRODUCTION

Basic life support (BLS) has been recognized as foundation of saving lives after cardiopulmonary arrest, whether in an out-of-hospital or in-hospital settings. Purpose of this workshop is to provide you an opportunity to learn the scientific knowledge and skills necessary to provide basic life support to any individual at your workplace or in the community. The sessions in this brief training activity will focus on what healthcare providers need to know to perform cardiopulmonary resuscitation (CPR) in a wide variety of in- and out-of-hospital settings.

The sessions in this workshop include:

1. Introduction to importance of 'Chains of Survival'
2. Recognizing a cardiac arrest event
3. Performing high-quality chest compressions in adults, child, and infant
4. 'Rescue breathing'
5. Providing breaths during Single- and Double Rescuer CPR
6. Learning to use Automated External Defibrillator (AED) in adults and children 8 years of age or older
7. Working in a Team
8. Relief of choking in adults, children, and infants

### LEARNING OUTCOMES

**After successful completion of the workshop, participants will be able to:**

1. Describe steps and critical interventions in adult and pediatric chains of survival, both in out-of-hospital and in-hospital settings.
2. Recognize signs necessitating immediate CPR in someone
3. Perform single- and two-rescuers high-quality CPR in adult, child, and infant
4. Provide 'Rescue breaths' and give breaths during single- and double-rescuer CPR
5. Demonstrate use of AED during CPR
6. Describe important principles of CPR in pregnant women
7. Demonstrate relief of choking in adult, child, and infant
8. Recognize importance of 'Working in a Team'
9. Describe essential measures adopted for CPR in suspected or known COVID-19 patients
10. Describe when to terminate resuscitation attempt

### AGE DEFINITIONS

1. **Infants:** Younger than 1 year of age (excluding neonates)
2. **Children:** From 1 year of age to puberty (signs of puberty include underarm hair in males and breast development in females)
3. **Adults:** Adolescents (after age of puberty) and older



## PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE helps to protect rescuers from health and safety risks. Provision of types of PPE depends upon local policies and protocols of the institution and availability. PPE commonly include gloves, eye protection, gowns, safety footwear, personal pocket masks, and special filters (high efficiency particulate air) for suspected or confirmed COVID-19 patients.

## USE OF TECHNOLOGY IN BLS: SMARTPHONES AND AUDIO-VISUAL AIDS

The new AHA guidelines recommend judicious use of smartphones and help of audio-visual feedback devices for high-quality CPR. Purposeful use of smartphones to call for emergency services reduces the time for emergency response system activation, promoting early CPR initiation and achieving optimum chain of survival.

Use of audiovisual feedback devices provide real-time information about compression rate, depth, and recoil to the rescuers aiding the provision of high-quality compressions and helping to achieve the targeted parameters of high-quality CPR. This allows rescuers make timely appropriate corrections for desired perfusion and better outcomes. Use of technology-aided CPR has been reported to 25% increase in survival due to improved CPR quality during in-hospital cardiac arrests.

## RECOGNITION OF EMERGENCY (CARDIAC ARREST)

1. Check for responsiveness
2. Check for respiration
3. Check for pulse

'Agonal gasps' may be present in the first few minutes after a cardiac arrest and are not regarded as normal breathing. **Gasping is a sign of cardiac arrest.**

### Signs of poor perfusion in infants and children include:

1. Temperature – cool extremities
2. Altered mental state – declining consciousness and responsiveness
3. Skin – Paleness, mottling and cyanosis
4. Pulse – weak pulse

## EMERGENCY RESPONSE SYSTEM

Emergency response system is the protocol developed by an institution and local government to respond to an emergent life threatening emergency. The rescuer must be aware of local in-hospital and out-of-hospital systems. One such out-of-hospital system in this country is 1122.

Using mobile phones to call for help is recognized as useful option, if appropriately employed.

## Session 1: CHAINS OF SURVIVAL

The American Heart Association (AHA) describes the term “Chain of Survival” as inter-related series of systematic, organized, coordinated efforts in a community to perform essential interventions in rapid succession to reduce the mortality associated with cardiac arrest. If any one of these actions is inadequate, survival is unlikely. Recognition of the emergency and prompt initiation of the Chain is the critical step for a successful outcome following a cardiac arrest. The survival rate to hospital discharge has been accepted as the “gold standard” to determine the effectiveness of timely and appropriate interventions for cardiac arrest. Chains of Survival have been described for Out-of-Hospital and In-Hospital cardiac arrests both for adult and pediatric age groups (Figure 1).

**Key elements of each chain of survival include:**

1. Prevention and preparedness
2. Activation of emergency response system
3. Provision of high-quality CPR
4. Early defibrillation
5. Post-cardiac arrest care
6. Recovery



Figure 1: Adult and Pediatric In-Hospital and Out-of-Hospital Chains of Survival

## Session 2: SINGLE-RESCUER ADULT CPR SEQUENCE

STEP	ACTION
1	Verify safety of the scene for you and the victim.
2	Check for responsiveness (tap on shoulders & shout "Are you OK?").
3	If the victim is not responsive, shout for nearby help. Activate emergency response system in your setting ( <i>may use mobile device, if appropriate</i> ). If you are alone, get the AED & emergency equipment. If someone else is available, send that person to get it.
4	<p><b>Check for CAROTID PULSE (Figure 2-a):</b></p> <ul style="list-style-type: none"> <li>Locate the larynx (on the side closest to you), using 2 or 3 fingers.</li> <li>Slide fingers into the groove between the larynx &amp; anterior border of sternocleidomastoid muscle at the level of cricoid cartilage.</li> <li>Feel for a pulse <i>for at least 5 seconds but no more than 10 seconds</i>.</li> </ul> <p>If you do not definitely feel a pulse, begin CPR, starting with chest compressions.</p> <p><b>Useful tip:</b></p> <ul style="list-style-type: none"> <li>Keep verbalizing in your heart 'one in one thousand, two in one thousand, three in one thousand, four in one thousand, five in one thousand, six in one thousand, seven in one thousand, eight in one thousand' while visually scanning for breathing and checking for the pulse. This will take 5 to 6 seconds and you are safe for a countdown of at least '5 seconds'.</li> <li>When an AED arrives, you have to remove all clothing that covers the chest. AED pads must never be applied over any clothing.</li> </ul>



**Figure 2:** (a) Check carotid pulse on your side and scan for respiration simultaneously (b) Remember Compressions, Airway and Breathing Sequence (c) Correct hand placement while using the C-A-B sequence for high-quality CPR (d) Chest compressions using one hand

## 5 High-Quality CPR: Begin with CHEST COMPRESSIONS

- Position yourself at the side of the victim.
- Ensure that the victim is lying face up on a firm and flat surface.
- Begin compressions within 10 seconds of recognition of cardiac arrest.
- Use compressions-to-ventilation ratio of 30 compressions to 2 breaths.
- Place the heel of one hand on the lower half of the sternum (in line of nipples) and the other hand on top of the first, with the long axis of the heel of your hand placed on the long axis of the sternum. Your fingers may be either extended or interlaced but should be kept off the chest (Figure 2-c).
- Straighten your arms, lock the elbows & position your shoulders directly over your hands.
- Start compressions by 'pushing hard and fast'; compressing at the rate of approximately 100/min with a depth of 4 to 5 cm (One and a half to 2 inches) for normal-sized adults
- Allow complete chest recoil after each compression by releasing the pressure completely and allowing the chest to return to its normal position after each compression
- Keep your hands in contact with the victim's sternum to maintain proper hand position.
- Minimize interruptions in compressions (limit them to less than 10 seconds).
- Perform cycles of 30 compressions and 2 breaths.

### Useful tips:

- If one finds difficult to push deeply during compressions (painful joint conditions), one may choose to put one hand on the breastbone to push on the chest while grasping the wrist of that hand with other hand to support the first hand while pushing the chest (Figure 2-d).
- Quickly move victim's bulky clothes out of your way. If clothes are difficult to remove, you can begin compressions over clothing.
- When AED becomes available, remove the clothing covering the chest. Never apply AED pads over clothes.

## 6 Reevaluate

Reassess after every 5 cycles of compressions and ventilations (30:2 ratio)

## 7 Use AED as soon as it is available and Check rhythm.

### Shockable rhythm:

Give 1 shock.

Resume CPR immediately for 2 minutes (until prompted by AED to allow rhythm check).

Continue until ALS providers take over or victim starts to move.

### Non-shockable rhythm:

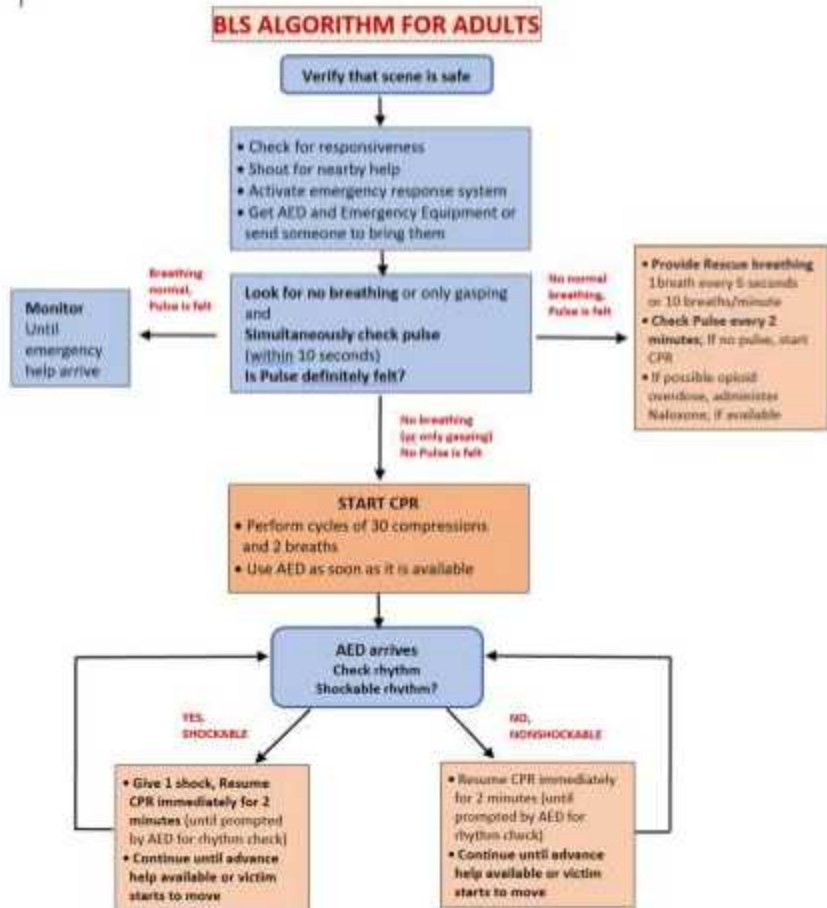
Resume CPR immediately for 2 minutes (until prompted by AED to allow for



rhythm check).

Continue until ALS providers take over or victim starts to move.

1



## Session 3-A: OPENING THE AIRWAY

For breaths to be effective, victim's airway must be open.

Two methods for opening the airway are:

- Head tilt-chin lift
- Jaw thrust

### HEAD TILT-CHIN LIFT (Figure 3-a):

STEP	ACTION
1	Place one hand on the victim's forehead & push with your palm to tilt the head back.
2	Place the fingers of the other hand under the bony part of the lower jaw near the chin.
3	Lift the jaw to bring the chin forward.



#### CAUTION

- Make sure that you are not pressing deeply into the soft tissue under the chin as you may yourself block the victim's airway.
- Do not completely close the victim's mouth.
- If a head or neck injury is suspected, use the jaw-thrust maneuver to reduce neck & spine movement.

### JAW THRUST (Figure 3-b)

STEP	ACTION
	Use Jaw thrust maneuver when chin-lift is not effective or a spinal injury is suspected.
1	Place one hand on each side of the victim's head. You may rest your elbows on the surface on which the victim is lying.
2	Place your fingers under the angle of the victim's lower jaw & lift with both hands, displacing the jaw forward.
3	If the lips close push the lower lip with your thumb to open the lips.



Figure 3 (a) Head tilt-chin lift



(b) Jaw thrust

## Session 3-B: GIVE BREATHS (ADULTS, CHILDREN AND INFANTS)

Breaths are given using a barrier device as standard precaution. Barrier devices include face shields and pocket masks. Face shields must be replaced with a pocket mask as soon as one is available.

**NOTE:** Infection acquired following a CPR is extremely unlikely, however standard precautions must be observed during CPR at workplace.

### Mouth-to-Mouth Breathing for Adults Using a Face Shield

STEP	ACTION
1	Use a barrier shield
2	Hold the victim's airway open with a head tilt-chin lift
3	Pinch the nose closed with your thumb and index finger (using the hand on forehead)
4	Take a regular (not deep) breath and seal lips around the victim's mouth, creating an airtight seal
5	Deliver 1 breath over 1 second Watch for the chest to rise as you give the breath
6	If the chest does not rise, repeat the head tilt-chin lift.
7	Give a second breath (over 1 second). Watch for the chest to rise
8	If you are unable to ventilate the victim after 2 attempts, promptly return to chest compressions

### Pocket Mask

Used for mouth-to-mouth breathing during CPR. Pocket masks usually have a one-way valve which allows the rescuer breath to enter victim's mouth but diverts exhaled air or secretions away from rescuer.

### Using a Pocket Mask

Open the airway using head tilt-chin lift technique, taking precautions not to overextend the neck especially in patients with suspected spinal injury.

STEP	ACTION
1	Position yourself at the side of victim (This will help to provide compressions and give breaths without changing the position every time during single rescuer CPR cycle of 30 compressions and 2 breaths, thus minimizing interruptions to less than 10 seconds)
2	<ul style="list-style-type: none"><li>Choose appropriate-sized mask (from nasal bridge to chin)</li><li>Place the pocket mask on victim's face using bridge of the nose</li></ul>

	<p>as guide for correct positioning</p> <ul style="list-style-type: none"> <li>• Place index finger and thumb of your hand which is close to the top of victim's head along the upper edge of mask and press firmly against face</li> <li>• Place thumb of your second hand along the lower edge of mask</li> <li>• Press the lower edge of mask between thumb on lower edge of mask and finger of same hand lifting the bony margin of the lower jaw</li> <li>• Achieve a seal with pocket mask against the face by pressing firmly around the outside edge of mask using correctly positioned thumbs and fingers of both hands</li> <li>• Perform head tilt-chin lift to open the airway</li> </ul>
3	<p>Deliver 2 breaths</p> <ul style="list-style-type: none"> <li>• Deliver each breath over 1 second</li> <li>• Note for the chest rise</li> <li>• Resume chest compressions in less than 10 seconds</li> </ul>

### Bag-Mask Ventilation

A bag-mask device (Figure 4) is used to provide positive-pressure ventilation to a victim who is either not breathing or not breathing normally. It consists of a self-inflating bag attached to a face mask (Ambu bag). The mask has a cup that should provide an airtight seal. If the seal is not airtight, ventilation will be ineffective. Consider connecting the bag to the tube from the oxygen source, if available.



**Figure 4:** Self-inflating bag & face mask device for adult (a) and infant (b)



### Using a bag-mask device

Follow the steps to open the airway with a head tilt-chin lift and use a bag-mask device to give breaths to the victim:

STEP	ACTION
1	Position yourself directly above the victim's head.
2	Choose proper size of the mask (from bridge of nose to chin). Place the nasal side (narrow part) of the mask on the victim's face, using the bridge of the nose as a guide for correct position.
3	Use the C&E clamp technique to hold the mask in place while you lift the jaw to hold the airway open (Figure 5- a & b): <ul style="list-style-type: none"><li>• Perform a head tilt.</li><li>• Place the mask on the face with narrow portion at the bridge of nose.</li><li>• Use the thumb &amp; index finger of one hand to make a "C" on the upper surface of the mask, pressing its edges to the face.</li><li>• Use the remaining 3 fingers (forming an "E") to lift the angles of the jaw, open the airway, and press the face to the mask.</li></ul>
4	Squeeze the bag to give 2 breaths while watching for chest rise. Deliver each breath over 1 second, whether supplementary oxygen is being used or not. Note visible chest rise with each breath.



Figure 5: C&E Technique (a)

(b)

(a) Thumb and Index finger forming a 'C' and pressing the mask against face.

(b) remaining 3 fingers forming an 'E', lifting the mandible towards mask to achieve a tight seal (Note the rescuer position directly above the victim's head)

## Session 3C: RESCUE BREATHS

Rescue breathing is giving breaths to an unresponsive victim who has a pulse but is not breathing or only gasping.

**When emergency equipment is available**

- Bag mask device
- Barrier device (face shield or pocket mask)

**When no emergency equipment is available**

- Mouth-to-mouth technique
- Mouth-to-mouth-and nose technique

**Rescue breathing for adults**

- Give 1 breath every 6 seconds
- Give each breath over 1 second
- Notice the visible chest rise
- Check pulse after about every 2 minutes

**Rescue breathing for infants and children**

- Give 1 breath every 2 to 3 seconds
- Give each breath over 1 second
- Notice the visible chest rise
- Check pulse after about every 2 minutes



### **CAUTION - Risk of Gastric Distension**

There is risk of gastric inflation if ventilation is provided too quickly, forcefully, or with too much volume. This may result in serious complications, like aspiration.

**To avoid gastric distension** while providing breaths, whether during CPR or as rescue breaths:

- Deliver each breath over 1 second
- Deliver just enough to make victim's chest rise

### **SWITCHING FROM RESCUE BREATHING TO CPR**

While providing rescue breathing, switch to CPR if:

- I. Pulse is no longer felt in adults, children and infants
- II. The infant or child's heart rate is less than 60/minute
- III. There are signs of poor perfusion in infant despite oxygenation and ventilation

## Session 3D: BREATHING TECHNIQUE FOR INFANTS

TECHNIQUE	ACTION
<b>Mouth-to-mouth-and-nose</b>	<ul style="list-style-type: none"><li>• Maintain a head tilt-chin lift to keep the airway open</li><li>• Place your mouth over the infant's mouth &amp; nose and create an airtight seal</li><li>• Blow into the infant's nose &amp; mouth (pausing to inhale between breaths), just enough to make the chest rise with each breath (Figure 6)</li><li>• If the chest does not rise, repeat the head tilt-chin lift to reopen the airway and try to give a breath that makes the chest rise. It may be necessary to move the infant's head through a range of positions to provide effective breaths</li></ul>

The mouth-to-mouth-and-nose technique is preferred for infants. However, if you can't cover the infant's nose and mouth with your mouth, use the mouth-to-mouth technique, after pinching the nose, as in adults/ children. Keep infant's head in neutral (sniffing) position, so that infant's external air canal is level with top of the infant's shoulder. If you tilt (extend) an infant's head beyond neutral position, it may block the airway.



**Figure 6:** Mouth-to-mouth-and-Nose Breathing for infant  
Note the chest rise being checked simultaneously while giving breaths

## Session 4: ADULT 2-RESCUERS CPR SEQUENCE

STEP	ACTION
1	Verify that the scene is safe for the rescuers & the victim
2	Check for responsiveness. Tap the victim's shoulder & shout, "Are you OK?"
3	If the victim is not responsive: The first rescuer assesses the victim, and if no mobile phone is available sends the 2 <sup>nd</sup> rescuer to activate the Emergency Response System and bring the AED, Naloxone and emergency equipment
4	If the victim is not breathing & has no pulse: <ul style="list-style-type: none"><li>• 1<sup>st</sup> rescuer (Compressor) begins high-quality CPR, starting with chest compressions, as in single rescuer sequence</li><li>• Once the 2<sup>nd</sup> rescuer (Ventilator) returns &amp; 2-rescuers CPR can be provided:</li><li>• The second rescuer takes over the compressions after providing 2 ventilations</li><li>• The first rescuer takes over the role of ventilator, providing 2 breaths after every 30 compressions, each breath over 1 second</li><li>• <b>The rescuers should switch roles about every 2 minutes or 5 cycles of 30 compressions and 2 breaths (Figure 7)</b></li></ul>



**Figure 7: Two-rescuers CPR.** This is important that second rescuer takes the compression responsibility after providing 2 ventilations to avoid fatigue and maintain CPR quality



## **Session 5: AUTOMATED EXTERNAL DEFIBRILLATOR – ADULTS AND CHILDREN 8 YEARS OF AGE OR OLDER**

An automated external defibrillator (AED) is a portable, computerized device that can identify an abnormal heart rhythm which needs a 'shock' in a cardiac arrest patient. The AED then delivers a shock that can terminate the abnormal cardiac rhythm and restores the normal rhythm. AED identifies abnormal cardiac rhythms as either 'shockable' or 'non-shockable'. The shockable rhythm is treated with 'defibrillation' which refers to stopping the abnormal cardiac rhythms by delivering controlled electrical shocks resulting in restoration of an organized rhythm. AED is made available for trained public use at every busy public place and community service areas as part of Public Access Defibrillation (PAD) programs under AHA recommendations.

### **IMPORTANT CONSIDERATIONS**

AED needs regular periodic maintenance according to manufacturer instructions.

- Maintenance of battery
- Availability and maintenance of accessories (Adult and Pediatric Pads)

- **Keep the time between last compressions and shock delivery to a minimum**
- **Resume high-quality CPR immediately after AED use**
- **Always place the AED pads directly on the bare skin, avoiding contacts with clothing, medication patches or implantation devices**
- **If victim is wet with water, sweat, or in ice, quickly wipe the chest before attaching the pads**
- **Use an AED for a pregnant woman in cardiac arrest as it is used for any cardiac arrest victim**
- **Jewelry is not needed to be removed if it is not in contact with AED pads**
- **Shave the excess hair or if you have extra pad, press the sticky surfaces of pads to hair and quickly pull them off**

## STANDARD STEPS FOR OPERATING AN AED FOR ADULTS AND CHILDREN (8-YEARS OF AGE AND ABOVE)

During the high-quality adult single-rescuer CPR, AED is used immediately when available.

### Follow the steps:

1

- Open the carrying case. **Power on the AED**
- Some devices will "power on" automatically when you open the lid or case
- Follow the AED prompts as a guide to next steps**

2

- Attach AED pads to the victim's bare chest**
- Choose adult pads for victims 8 years of age and older
- Follow the placement diagrams on the pad**
- Peel the backing away from the AED pads
- Attach the adhesive AED pads to the victim's bare chest according to placement diagrams mentioned on pads (One pad directly below the right collar bone, second pad to the side of left nipple, with its top edge at least 7 to 8 cm below the armpit) (Figure 8-a)
- Attach the AED connecting cables to the AED device**

3

- Stop CPR when the AED prompts you**
- "Clear" the victim and allow the AED to analyze the rhythm** (Figure 8-b)
- Ensure that no one is touching the victim, not even the rescuer in charge of giving breaths
- The AED then tells you if a shock is needed.

4

- If the 'rhythm is shockable', the AED advises a shock, AED will tell you to clear the victim and press the shock button to deliver a shock
- Clear the victim** before delivering the shock (no one should touch him)
- Loudly state, "I am clear, you are clear, everyone is clear"**
- Look around to be sure that no one is in contact with the victim
- Press the shock button**
- The shock will produce a sudden contraction of the victim's muscles

5

- If 'rhythm is nonshockable', no shock is needed
- Immediately resume CPR**, starting with chest compressions

6

- After about 5 cycles or 2 minutes of CPR, the AED will prompt you again to stop CPR in order to analyze the rhythm.
- Follow the steps 3 and 4 of AED use



(a)



(b)

**Figure 8:** (a) Application of adult AED pads (b) the rescuer staying away while AED analyzing the rhythm

## Session 6: SEQUENCE FOR 2-RESCUERS CPR WITH AN AED

1

- Ensure scene safety

2

- Tap and check for responsiveness

3

- If the victim does not respond:
- The first rescuer stays with the victim and performs the next step
- The second rescuer activates the emergency medical system & returns with the AED and Naloxone

4

- Ensure that victim lies face up on a flat and firm surface
- First rescuer scans for respiration and checks for pulse within 10 seconds

5

- If there is no breathing or agonal breathing and pulse is not felt
- The **first rescuer starts high-quality CPR** beginning with 30:2 cycles of chest compressions (100-120/minute, compressing chest at least 5 cm, allowing complete recoil) and breaths (each breath over 1 second, looking for visible chest rise), till the second rescuer arrives with the AED & Naloxone
- Second rescuer removes victim's clothing, switches on the AED and follows steps for AED use**
- The first rescuer continues CPR unless AED commands 'stay clear'** to analyze rhythm
- Follow AED commands
- Switch roles**, first rescuer taking the role for providing breaths and second rescuer begins compressions

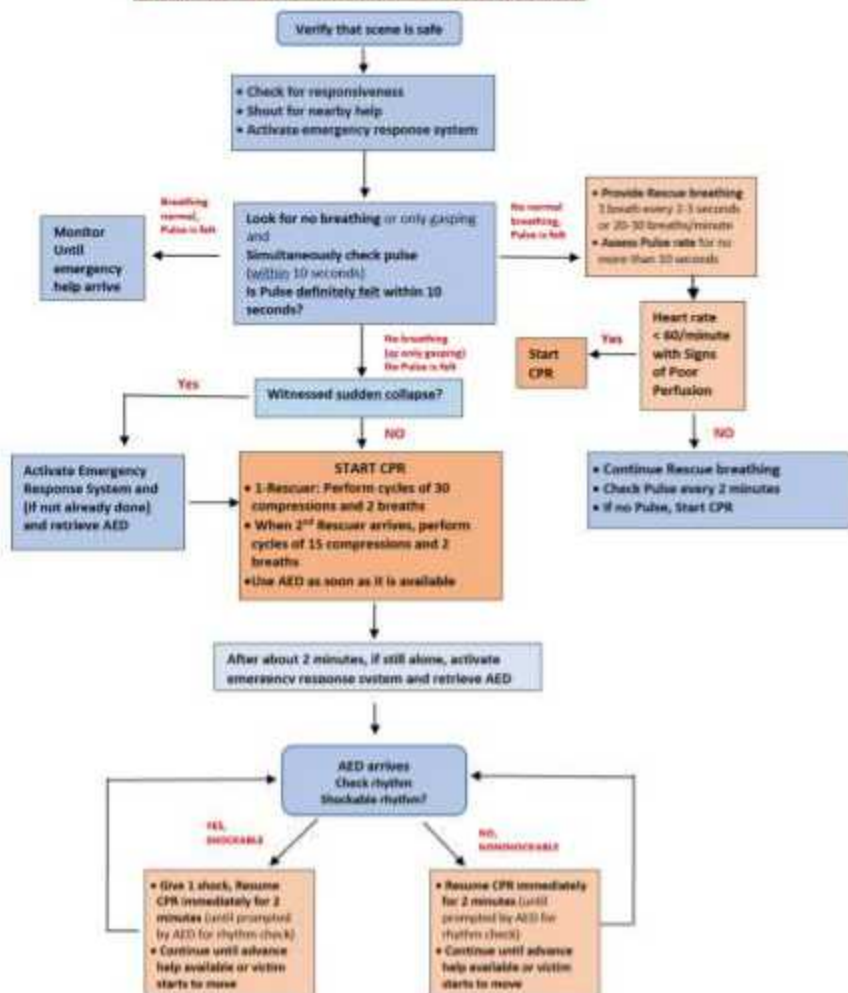


## Session 7-A: SINGLE-RESCUER CHILD (1 YEAR TO PUBERTY) CPR SEQUENCE

STEP	ACTION		
1	<ul style="list-style-type: none"> <li>Verify that the scene is safe for you and the victim</li> </ul>		
2	<ul style="list-style-type: none"> <li>Check for responsiveness by tapping on the child's shoulders; shout 'are you OK'</li> </ul>		
3	<ul style="list-style-type: none"> <li>If the victim is not responsive, shout for nearby help, activate emergency response system or call 1122 via mobile device (if possible), send somebody to bring AED</li> </ul>		
4 <b>BREATHING &amp; PULSE</b>	Assess for breathing and pulse (carotid or femoral) simultaneously (no more than 10 seconds): Check for pulse by palpating either the carotid or the femoral artery Locating the femoral pulse: <ul style="list-style-type: none"> <li>Place 2 or 3 fingers in the inner thigh, midway between the hipbone and the pubic bone just below the crease where the leg meets the body</li> <li>Feel for a pulse for at least 5 but no more than 10 seconds</li> <li>If you do not definitely feel a pulse, begin high-quality CPR, starting with chest compressions</li> </ul>		
5 <b>NEXT ACTION</b>	Breathing	Pulse	Action
5A	Breathing normally	Present	Monitor the victim until emergency help available
5B	Not breathing normally	Present	Provide rescue breathing: <ul style="list-style-type: none"> <li>Give 1 breath every 2 to 3 seconds (about 20-30 breaths per minute)</li> <li>Assess pulse rate for no more than 10 seconds</li> <li>Continue rescue breathing if heart rate &gt; 60/minute and check pulse every 2 minutes</li> <li>Add compressions if pulses 60/min with signs of poor perfusion</li> <li>Confirm that the emergency response system has been activated</li> <li>Be ready to perform CPR if you do not feel a pulse</li> </ul>
5C	Not breathing normally or gasping	No pulse	If you are alone and arrest was sudden and witnessed: <ul style="list-style-type: none"> <li>Leave the victim to activate the Emergency Response System</li> </ul>

			<ul style="list-style-type: none"> <li>• Get the AED and emergency equipment</li> <li>• If someone else is available, send that person to activate emergency response system and get AED and emergency equipment</li> </ul> <p>If you are alone and arrest was not witnessed:</p> <ul style="list-style-type: none"> <li>• Begin high-quality CPR with cycles of 30 compressions and 2 breaths for 2 minutes</li> <li>• After 2 minutes of high-quality CPR, if you are still alone, activate the emergency response system and get and AED</li> <li>• Use the AED following its prompts</li> <li>• If AED detects shockable rhythm – Give one shock and resume CPR immediately for 2 minutes until AED prompts again to analyze rhythm</li> <li>• If AED detects non-shockable rhythm, resume high quality CPR until prompted by AED for a rhythm check about every 2 minutes.</li> </ul>
<p><b>6 COMPRESSIONS</b></p>	<ul style="list-style-type: none"> <li>• For children, either 1 or 2 hands can be used to compress the chest</li> <li>• Place heel of one hand in the center of the victim's chest on the lower half of sternum (in the nipple line), with the heel of one hand on top of the other</li> <li>• For small child, 1-handed compression may be adequate to achieve desired compression depth</li> <li>• Compress at least <math>\frac{1}{3}</math><sup>rd</sup> of the anteroposterior (AP) diameter of the child's chest or about 5 cm</li> <li>• Allow for complete chest recoil, avoid leaning on the chest between compressions, while maintaining the hand's position</li> <li>• The universal rate for compressions is 100 to 120/minute</li> <li>• The compression-to-ventilation ratio should be 30:2 and each breath is given over 1 second</li> </ul>		

## PEDIATRIC BLS ALGORITHM – SINGLE RESCUER



## Session 7-B: 2-RESCUERS CHILD BLS SEQUENCE

1

- Check for responsiveness
- Shout for nearby help
- **First rescuer stays with child**
- **Second rescuer activates emergency response system and retrieves the AED and emergency equipment**

2

- Look for no breathing or only gasping and check pulse simultaneously
- Is pulse definitely felt within 10 seconds?

3

- **Normal breathing and pulse is felt**
  - Monitor until emergency responders arrive
- **No normal breathing but pulse is felt**
  - Provide rescue breathing (1 breath every 2-3 seconds (20-30/minutes))
  - Reassess Pulse for no more than 10 seconds after every 2 minutes

4

- **No breathing or only gasping and no pulse is felt**
  - Shift to a flat and firm surface
  - Start high-quality CPR
    - First Rescuer performs cycles of 30 compressions and 2 breaths
    - When Second Rescuer returns with AED and Emergency Equipment, takes over compressions providing 15 compressions
  - First rescuer gives 2 breaths, each breath over 1 second
  - Both Rescuers switch roles every 2 minutes, continuing with cycles of 15 compressions and 2 breaths
  - Use AED as early as possible

5

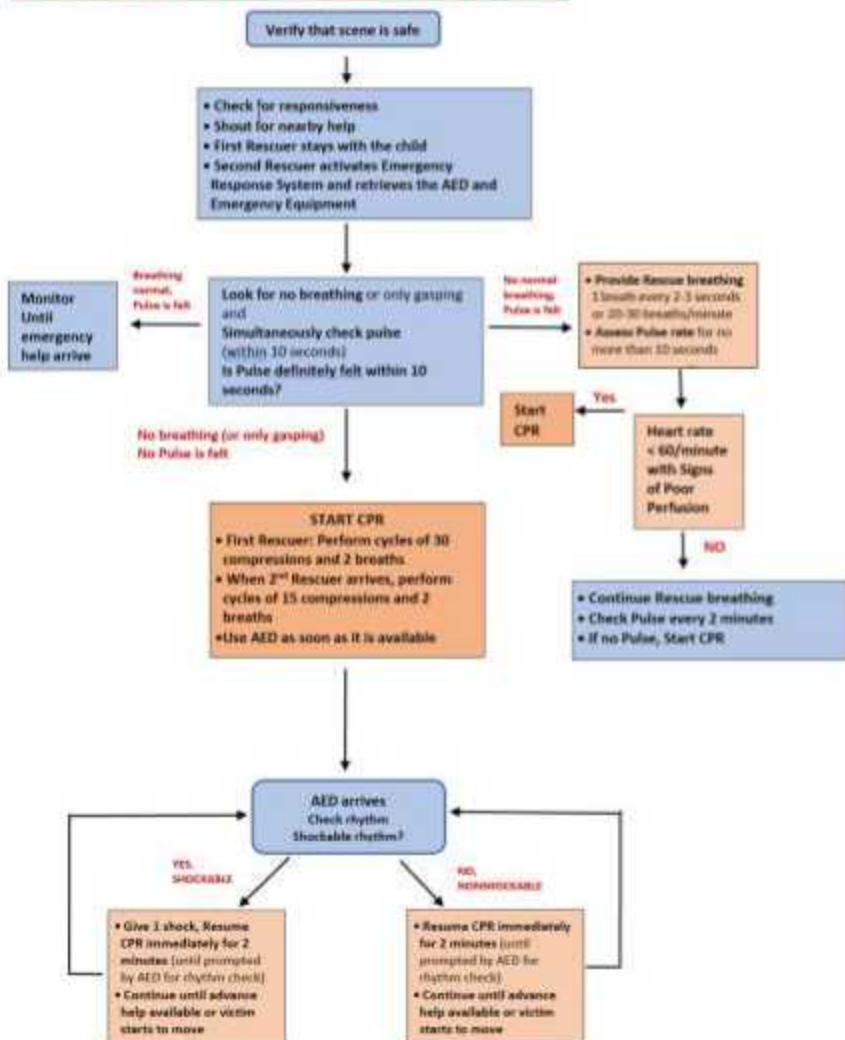
- Check rhythm
- **Shockable rhythm?**
  - Give 1 shock
  - Resume high-quality CPR immediately for 2 minutes (cycles of 15 compressions and 2 breaths) unless prompted by AED to allow for rhythm check
- **Nonshockable rhythm**
  - Resume high-quality CPR immediately for 2 minutes (cycles of 15 compressions and 2 breaths) unless prompted by AED to allow for rhythm check

6

- Continue unless advanced help takes over or child starts to move



## PEDIATRIC BLS ALGORITHM – TWO OR MORE RESCUERS

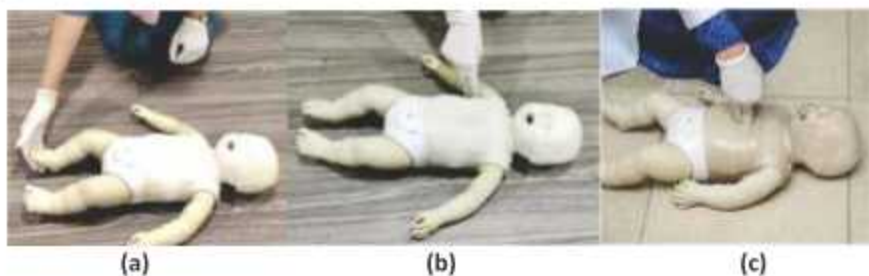


## Session 8-A: SINGLE RESCUER INFANT (LESS THAN 1 YEAR) CPR SEQUENCE

STEP	ACTION		
1	<ul style="list-style-type: none"> <li>Verify that the scene is safe for you and the victim</li> </ul>		
2	<ul style="list-style-type: none"> <li>Check for responsiveness by tapping on the heels of infant (Figure 9-a)</li> </ul>		
3	<ul style="list-style-type: none"> <li>If the victim is not responsive, shout for nearby help. Activate emergency response system or call 1122 via mobile device (if possible).</li> </ul>		
4 <b>BREATHING &amp; PULSE</b>	<p>Check for normal or no breathing (not more than 10 seconds):</p> <ul style="list-style-type: none"> <li>If the victim is breathing, monitor the victim until additional help arrives</li> <li>If the victim is not breathing or only gasping, the victim has respiratory or cardiac arrest or both</li> </ul> <p>Check for pulse by palpating the brachial pulse on your side in infant.</p> <p>Locating the brachial pulse (Figure 9-b):</p> <ul style="list-style-type: none"> <li>Place 2 or 3 fingers on the inside of the upper arm, midway between the infant's elbow and the shoulder.</li> <li>Then press the fingers to attempt to feel the pulse for at least 5 but no more than 10 seconds.</li> </ul> <p>If you do not definitely feel a pulse, begin high-quality CPR, starting with chest compressions.</p>		
5 <b>NEXT ACTION</b>	Breathing	Pulse	Action
5A	Breathing normally	Present	Monitor the victim until emergency help arrives
5B	Not breathing normally	Present	<p>Provide rescue breathing:</p> <ul style="list-style-type: none"> <li>Add compressions if pulse remains <math>\leq 60</math>/min with signs of poor perfusion</li> <li>Confirm that the EMS has been activated</li> <li>Continue breathing and check pulse every 2 minutes. Be ready to perform CPR if you do not feel a pulse.</li> </ul>

5C	Not breathing normally or gasping	No pulse	<p>If you are alone and arrest was sudden and witnessed:</p> <ul style="list-style-type: none"> <li>• Leave the victim or carry the victim with you to activate the emergency response system or call 1122.</li> <li>• Get the AED and emergency equipment.</li> <li>• If someone else is available, send that person to get it.</li> </ul> <p>If you are alone and arrest was not witnessed:</p> <ul style="list-style-type: none"> <li>• Begin high-quality CPR for 2 minutes.</li> </ul>
6 COMPRESSIONS	<p>2-finger technique for chest compressions is used for infants (1 rescuer):</p> <ul style="list-style-type: none"> <li>• Place the infant on a firm, flat surface</li> <li>• Place 2 fingers in the center of the infant's chest, just below the nipple line, on the lower half of sternum (Figure 9-c)</li> <li>• Give compressions at a rate of 100-120/minute</li> <li>• Compress at least 1/3<sup>rd</sup> of the anteroposterior (AP) diameter of the infant's chest or approximately 4 cm</li> <li>• Allow complete chest recoil at end of each compression; do not lean on the chest, keep the fingers in position</li> <li>• After every 30 compressions, open the airway with a head tilt-chin lift and give 2 breaths, each over 1 second.</li> <li>• Note chest rise with each breath.</li> <li>• After about 5 cycles or 2 minutes of CPR, if you are alone and no one has activated the emergency response system, leave the victim (or carry the victim with you) and activate the emergency response system and get an AED</li> </ul>		

<p><b>7</b> <b>AED</b></p>	<p>Use the AED as soon as it is available using the pediatric pads or pads with pre connected dose attenuator</p> <ul style="list-style-type: none"> <li>• Most AEDs are designed for both pediatric and adult resuscitation</li> <li>• When pediatric pads are used, apply one pad on front and the second on the back of chest in infants</li> <li>• With Pediatric pads, the AED delivers a reduced shock</li> <li>• One way of reducing the shock dose is by attaching a pediatric dose attenuator to the AED. The dose attenuator is frequently pre connected to pediatric pads</li> <li>• If the AED cannot deliver a pediatric dose, use the adult dose</li> <li>• If you are using an AED for an infant or child under 8 years of age and pediatric pads are not available, use adult pads placing them anterior and posterior to victim</li> </ul>
<p><b>8</b> <b>RESUME CPR</b></p>	<p>After shock delivery or if no shock advised, immediately resume high-quality CPR, starting with compressions. Continue to provide CPR until advance life support providers take over or the infant begins to breathe or move.</p>



**Figure 9: Single-rescuer infant CPR:** (a) Check for responsiveness by tapping on heel (b) Check for brachial pulse on your side (c) Begin chest compressions with 2 fingers method



## Session 8-B: 2-RESCUERS INFANT (1 YEAR TO PUBERTY) CPR SEQUENCE

- 1 •Verify that the **scene is safe** for you and victim
- 2 •Check for **responsiveness** by **tapping on victim's heel and shouting "baby, baby are you OK"** and shout for help
- 3 •**If the victim is not responsive:**
  - The **first rescuer** initiates the resuscitation attempt
  - The **second rescuer** activates the emergency response system, gets an AED & emergency equipment and returns to the victim to help with CPR and use of AED
- 4 •Assess for **breathing and circulation simultaneously for no more than 10 seconds**. Assess for brachial pulse on victim's arm on your side
- 5 •**Monitor, if normal breathing and pulse** felt until emergency help arrives
  - If Breathing is not normal and Pulse > 60/minute and no signs of poor perfusion, Provide Rescue Breaths giving 1 breath every 2-3 seconds or about 20-30 breaths/minute.** Continue rescue breathing and check pulse about every 2 minutes. If no pulse start high-quality CPR
  - If Pulse <60/min or signs of poor perfusion, start high-quality CPR**
- 6 •Start with **high-quality CPR:**
  - The **1st rescuer begins CPR**, starting with chest compressions, **using thumb-encircling hands technique**
  - 2nd Rescuer gives 2 breaths after every 15 compressions**
  - Rescuers should switch roles** about every 5 cycles or 2 minutes of CPR
- 7 •Use the **AED** as soon as it is available and follow AED prompts
  - Use infant AED Pads, when available, placing one in front and second on back of infant's chest (Figure 10 a & b)
  - Use adult pads, with shock attenuator if available, when pediatric pads are not available (Figure 10 c & d)
- 8 •If a **"shock is advised"**, Give **1 shock** and immediately **resume high-quality CPR for 2 minutes**, until prompted by AED for rhythm check
  - If **"no shock is advised"**, immediately resume high quality CPR for **2 minutes**, until prompted by AED for rhythm check
  - Continue to provide CPR and follow the AED prompts until advance life support providers take over or the victim starts to move



Figure 10:(a)

(b)

(c)

(d)

Pediatric AED Pads with shock dose attenuator (a & b), Pad applied to anterior chest (c), Compressions being done on the pad after AED delivers or does not advise shock

## 2-Thumb-Encircling Hands Technique for 2-Rescuers' CPR in Infant

- Place the infant on a firm, flat surface in sniffing position
- Place both thumbs side-by-side in the centre of the infant's chest, on the lower half of sternum, with the fingers of both hands encircling the infant's chest and supporting the infant's back
- With your hands encircling the chest, place both thumbs side by side on the lower half of sternum in the centre of infant's chest. Use both thumbs to compress the sternum at a rate of 100 to 120/minute (Figure 11-a). Thumbs may overlap on very small infants.
- Compress at least  $\frac{1}{3}^{\text{rd}}$  the AP diameter (approximately 4 cm)



Figure 11-a: 2 Thumb-Encircling Hands Technique for infant's chest compressions

- After each compression, let the chest completely recoil
- After every 15 compressions, second rescuer opens the airway with head tilt-chin lift technique and give 2 breaths, each over 1 second and ensuring the chest rise (Figure 11-b).
- Keep the interruptions in chest compressions minimized to less than 10 seconds.
- Continue cycles of 15 compressions to 2 breaths for about 2 minutes (5 cycles)
- Switch roles after 2 minutes
- Continue CPR until the AED arrives



**Figure 11-b: Two Thumb-Encircling Hands Technique in 2-Rescuers Infant CPR**  
(Note Second Rescuer at head end using pediatric bag-mask device to provide breaths)

## Session 9: CPR WITH AND WITHOUT AN ADVANCED AIRWAY

VENTILATION TECHNIQUES	COMPRESSIONS TO BREATHS (ADULT & CHILD)	COMPRESSIONS TO BREATHS (INFANT)
No advanced airway in place (e.g. mouth-to-mouth, bag-mask, pocket mask)	<ul style="list-style-type: none"> <li>• Compression rate of 100 to 120/min</li> <li>• 30 compressions to 2 breaths</li> </ul>	<ul style="list-style-type: none"> <li>• Compression rate of 100 to 120/min</li> <li>• 30 compressions to 2 breaths ( 1 rescuer)</li> <li>• 15 compressions to 2 breaths (2 rescuers)</li> </ul>
Advanced airway in place (laryngeal mask airway, supra-glottic airway device, endotracheal intubation)	<ul style="list-style-type: none"> <li>• Compression rate of 100 to 120/min</li> <li>• Continue compressions without pause for breaths</li> <li>• Adult: 1 breath every 6 seconds (10 breaths per minute)</li> <li>• Infant and Child 1 breath every 2-3 seconds (20-30 breaths per minute)</li> </ul>	



## Session 10-A: CHOKING RELIEF

### CHOKING RELIEF IN A RESPONSIVE ADULT OR CHILD

Use abdominal thrusts (the Heimlich maneuver) to relieve choking in a responsive adult or child.

Early recognition of foreign-body airway obstruction is important for successful outcome. Seeing an adult or child making the **universal choking sign** (clutching the throat with thumb and fingers of one or both hands), ask 'are you choking?' (Figure 12). If the victim nods and cannot talk, severe airway obstruction is present which needs immediate action.



Figure 12: Universal sign of choking

**Use abdominal thrusts or Heimlich maneuver**(Figure 13) to relieve choking in a responsive adult or child. It may be necessary to give multiple thrusts until either the obstruction is relieved, or victim becomes unresponsive.

## ABDOMINAL THRUSTS ON A VICTIM STANDING OR SITTING

1

- Stand or kneel behind the victim and wrap your arms around the victim's waist

2

- Make a fist with one hand

3

- Place the thumb side of your fist against the victim's abdomen, in the midline, slightly above the navel and well below the breastbone

4

- Grasp your fist with your other hand and press your fist into the victim's abdomen with a quick, forceful upward thrust

5

- Repeat thrusts until the object is expelled from the airway, or the victim becomes unresponsive

6

- Give each new thrust with a separate, distinct movement to relieve the obstruction



**Figure 13:** Heimlich maneuver for choking in a responsive adult (note thumb side of the fist against the victim's abdomen, slightly above the navel and well below the breastbone)



**CAUTION**

Do not attempt Heimlich maneuver if the person is coughing forcefully or able to speak since a strong cough may dislodge the object on its own.

## CHOKING RELIEF IN AN UNRESPONSIVE ADULT OR CHILD

1

- Shout for **help**. Send someone to activate the **emergency response system** or use **mobile** (if appropriate)

2

- Gently lower the victim to the ground if you see that he is becoming unresponsive

3

- **Begin CPR**, starting with chest compressions. **Do not check for a pulse**

4

- Each time you open the airway to give breaths, open the victim's mouth wide. Look for the object
- If you see an object that can be easily removed, remove it with your fingers
- If you do not see an object, continue CPR. (No blind sweeps)

5

- After about 5 cycles or 2 minutes of CPR, activate the emergency response system if someone has not already done so.

If a choking victim is already unresponsive when you arrive, you might not be sure if the unresponsiveness is due to foreign body obstruction. Activate the emergency response system and begin high-quality CPR immediately.

## Session 10-B: CHOKING RELIEF IN INFANT

### CHOKING RELIEF IN A RESPONSIVE INFANT

1

- Kneel or sit with the infant in your lap .

2

- If it is easy to do, remove clothing from the infant's chest

3

- Hold the infant facedown with the head slightly lower than the chest, resting on your forearm. Support the infant's head and jaw with your hand. Rest your forearm on your lap or thigh to support the infant

4

- Deliver up to 5 back slaps forcefully between the infant's shoulder blade, using the heel of your hand. Deliver each slap with sufficient force to attempt to dislodge the foreign body

5

- After delivering up to 5 back slaps, place your free hand on the infant's back, supporting the back of the infant's head with the palm of your hand.The infant will be adequately cradled between your two forearms with the palm of one hand supporting the face and jaw, while the palm of the other hand supporting the back of the infant's head (Figure 14-a and b)

6

- Turn the infant as a unit, while carefully supporting the head and neck. Hold the infant's face up, with your forearm resting on your thigh. Keep the infant's head lower than the trunk

7

- Provide up to 5 quick downward chest thrusts, in the middle of the chest, 1 finger breath below nipple line. Deliver chest thrusts at a rate of about 1 per second, each with the intention of creating enough force to dislodge the foreign body

8

- Repeat the sequence of up to 5 back slaps and up to 5 chest thrusts until the object is removed or the infant becomes unresponsive





(a)



(b)

### Figure 14: Back slaps and chest thrusts in a conscious choking infant

(a) Chest thrusts, note back hand supporting the back, neck and head and left leg slanting down to facilitate expulsion of foreign body with chest thrusts (b) Back slaps – note the infant shifted on to right leg, fingers of lower hand have been spread to support cheeks and forehead without obstructing the nose and mouth, arm supporting the body and leg slanted to facilitate the expulsion of foreign body

### CHOKING RELIEF IN AN UNRESPONSIVE INFANT

1

• Shout for help. Ask someone to activate EMS. Place infant on a flat, firm surface

2

• Begin CPR. 1 extra step: each time you open the airway, look for the object in the back of the mouth. If you SEE the object, only then remove it

3

• After about 2 minutes of CPR, activate EMS (if no one has done so already)



#### CAUTION

Never perform a blind finger sweep because it may push the foreign body back into the airway, causing further obstruction or injury.

## Session 11-A: CARDIAC ARREST IN PREGNANCY

Cardiac arrest in pregnancy is one of the most challenging clinical scenarios. Whereas various steps of resuscitation are similar to standard adult resuscitation, some considerations are uniquely different in this situation. Most obvious difference is that there are 2 patients, the mother and the fetus. Caregivers must thoroughly understand the altered anatomy and physiology in pregnant state and its effect on maternal mortality to best prevent and treat cardiac arrest in pregnancy. Maternal mortality is defined as the death of a woman during pregnancy and up to 42 days after delivery or termination of pregnancy, provided that the cause of death is related to or aggravated by the pregnancy or its management. Management decisions made during a maternal cardiac arrest may require estimation of gestational age. If a tape measure is not available, finger breadths are usually used as a surrogate for the centimeters. Classically accepted rule-of-thumb landmarks include: gestational age is 12 weeks if the uterus is palpable at above the pubic symphysis, 20 weeks if the uterus is palpable at the level of the umbilicus, and 36 weeks if the uterus is palpable at the level of the xiphisternum. The unique physiology and anatomy of pregnancy renders the patient vulnerable to hypoxemia and subsequent apnea with rapid development of desaturation due to aortocaval compression by gravid uterus when the patient is unconscious and supine. First BLS responder should initiate the usual resuscitation measures simultaneously, including placement of the backboard, provision of high-quality CPR, appropriate airway management, defibrillation when appropriate. **Manual left uterine displacement (LUD)** helps to relieve pressure on large blood vessels in a visibly pregnant woman (approximately 20 weeks). Continuous manual LUD should be performed on all pregnant women with advanced pregnancy who are in cardiac arrest in whom the uterus is palpated at or above the umbilicus to relieve aortocaval compression during resuscitation (Figure 15). To accomplish all tasks effectively, a minimum of 4 BLS responders should be present. If the woman is revived successfully, she should be placed on her left side to improve blood flow to the heart and, therefore, to the baby.



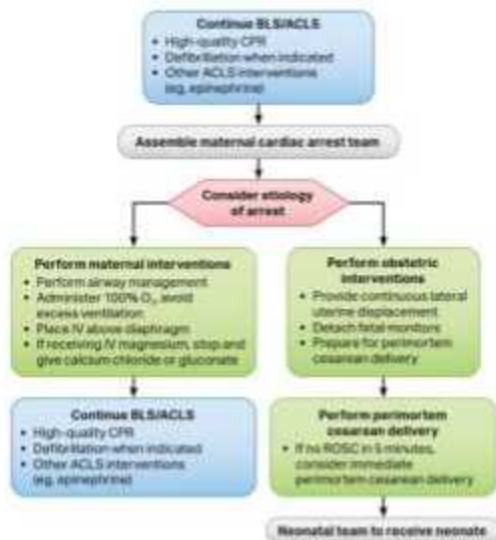
**Figure 15:** Manual left uterine displacement (LUD) by 2-handed technique to avoid aortocaval compression

Sequence and steps of CPR remain the same as for any other patient. Chest compressions should be performed at a rate of at least 100 per minute at a depth of at least 2 inches (5 cm), allowing full recoil before the next compression, with minimal interruptions, and at a compression-ventilation ratio of 30:2. Interruptions must be minimized and limited to 10 seconds except for specific interventions such as insertion of an advanced airway or use of a defibrillator. Because an immediate caesarean delivery may be the best way to optimize the condition of the mother and fetus, this operation should optimally occur at the site of the arrest and a pregnant patient with in-hospital cardiac arrest should not be transported for caesarean delivery. Management should occur at the site of the arrest if expertise is available. Rapid transport to a facility that can perform a caesarean delivery may be required for out-of-hospital cardiac arrest or cardiac arrest that occurs in a hospital not capable of caesarean delivery.<sup>1</sup>

#### REFERENCE:

1. Jeejeebhoy FM, Zelop CM, Lipman S, Carvalho B, Joglar J, Mhye JM, et al. Cardiac Arrest in Pregnancy: A Scientific Statement From the American Heart Association. *Circulation*. 2015 Nov 3;132(18):1747-73. doi: 10.1161/CIR.0000000000000300.

## Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm



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### Maternal Cardiac Arrest

- Team planning should be done in collaboration with the obstetric, neonatal, emergency, anesthesiology, intensive care, and cardiac arrest services.
- Priorities for pregnant women in cardiac arrest should include provision of high-quality CPR and relief of aortic/caval compression with lateral uterine displacement.
- The goal of perimortem cesarean delivery is to improve maternal and fetal outcomes.
- Ideally, perform perimortem cesarean delivery in 5 minutes, depending on provider resources and skill sets.

### Advanced Airway

- In pregnancy, a difficult airway is common. Use the most experienced provider.
- Provide endotracheal intubation or supraglottic advanced airway.
- Perform waveform capnography or capnometry to confirm and monitor ET tube placement.
- Once advanced airway is in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions.

### Potential Etiology of Maternal Cardiac Arrest

- A** Anesthetic complications
- B** Bleeding
- C** Cardiovascular
- D** Drugs
- E** Embolic
- F** Fever
- G** Genetic/nongenetic causes of cardiac arrest (Pfs and Tfs)
- H** Hypertension



## Session 11-B: NEONATAL RESUSCITATION

It is estimated that approximately 10% of newly born infants need help to begin breathing at birth,<sup>1</sup> and approximately 1% need intensive resuscitative measures to restore cardiorespiratory function. When possible, healthy term babies should be managed skin-to-skin with their mothers. After birth, the baby should be dried and placed directly, skin-to-skin, with attention to warm coverings and maintenance of normal temperature. There should be ongoing evaluation of the baby for normal respiratory transition. Radiant warmers and other warming adjuncts are suggested for babies who require resuscitation at birth, especially very preterm and very low-birth-weight babies.

Stimulation may be provided to facilitate respiratory effort. Suctioning may be considered for suspected airway obstruction.

1. Inflation and ventilation of the lungs are the priority in newly born infants who need support after birth.
2. A rise in heart rate is the most important indicator of effective ventilation and response to resuscitative interventions.
3. Pulse oximetry is used to guide oxygen therapy and meet oxygen saturation goals.
4. Chest compressions are provided if there is a poor heart rate response to ventilation after appropriate ventilation corrective steps, which preferably include endotracheal intubation.

### Assessment of Heart Rate

Heart rate is assessed initially by auscultation and/or palpation. Oximetry and electrocardiography are important adjuncts in babies requiring resuscitation.

### Positive-Pressure Ventilation (PPV)

PPV remains the primary method for providing support for newborns who are apneic, bradycardic, or demonstrate inadequate respiratory effort. Most babies will respond to this intervention. An improvement in heart rate and establishment of breathing or crying are all signs of effective PPV.

### Oxygen Therapy

PPV may be initiated with air (21% oxygen) in term and late preterm babies, and up to 30% oxygen in preterm babies. Oximetry is used to target the natural range of oxygen saturation levels that occur in term babies.

### Chest Compressions

If the heart rate remains less than 60/min despite 30 seconds of adequate PPV, chest compressions should be provided. The suggested ratio is 3 chest compressions synchronized to 1 inflation (with 30 inflations per minute and 90 compressions per minute) using the 2 thumb-encircling hands technique for chest compressions.

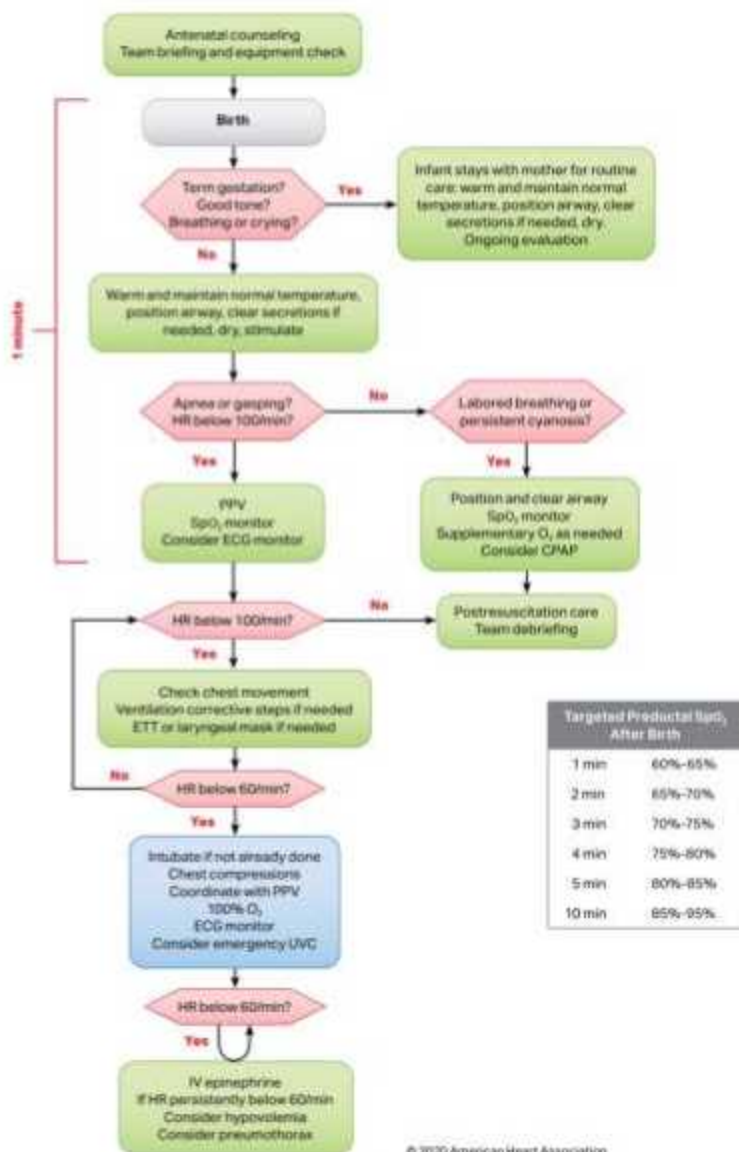
**The importance of skin-to-skin care in healthy babies** is emphasized as a means of promoting parental bonding, breast feeding, and normothermia.

**Team training** remains an important aspect of neonatal resuscitation, including anticipation, preparation, briefing, and debriefing. Rapid and effective response and performance are critical to good newborn outcomes.

## REFERENCE:

1. Aziz K, Lee CHC, Escobedo MB, Hoover AV, Kamath-Rayne BD, Kapadia VS, et al. Part 5: Neonatal Resuscitation 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Pediatrics*. 2021 Jan;147(Suppl 1):e2020038505E. doi: 10.1542/peds.2020-038505E. Epub 2020 Oct 21.

### Neonatal Resuscitation Algorithm



## Session 12: WORKING IN A TEAM (COACH, LEADER, TEAM MEMBER)

Successful resuscitation attempt depends upon high-quality resuscitation skills, good communication and effective team dynamics. While working as a team at your workplace, effective team dynamics increase the chances of successful resuscitation.

Having attended the BLS course and taking part in various resuscitation events, you might find yourself in a team leader or coach role.

Three elements of team dynamics during resuscitation include:

1. **Roles and responsibilities**
2. **Communication**
3. **Debriefing**

### 1. Roles and Responsibilities

**Assign role responsibilities** to team members clearly and delegate tasks to each member according to his/her skill level.

**Know limitations** of team members. All team members should know their limitations. Team leader needs to be aware of team members and his/her own limitations.

**Offer constructive intervention.** There may be some point in resuscitation event when you may need to point out another team member's incorrect or inappropriate actions. It is important to intervene tactfully in a constructive way preventing an adverse resuscitation event, at the same time not annoying, humiliating or insulting a member. This is especially important when someone is about to make a mistake on a drug, dose, or intervention step.

### 2. Communication

**Knowledge sharing** is important for effective team performance. Keep asking good ideas about managing a resuscitation attempt as well as observations about possible oversights during the event.

**Summarize and reevaluate** the resuscitation attempt loudly. It helps members respond to the victim's changing condition and team's progress within the algorithm of care.

**Use closed loop communication** to prevent misunderstandings and treatment errors. Closed loop consists of sender giving a message, receiver repeating it back, and sender confirming it was heard correctly. Call each member by name while assigning the task

**Give clear message** (Mr. A, you begin chest compressions at rate of 100 to 120/minute, ensuring correct positioning, and at least 5 cm depth and allowing complete recoil)

**Show mutual respect** and a professional attitude, regardless of each member's skill or training level.

### 3. Debriefing

**Debriefing** is an opportunity for the team to discuss how the resuscitation went, identify why a team member or team took certain actions and discuss how can be performance improved in future attempts.

**The CPR coach** will observe and help improve performance of compressions and ventilations by ongoing coaching during the resuscitation attempt.

#### THE CPR COACH

AHA recommends adding the role of a CPR coach to the resuscitation team. CPR coach coordinates effective initiation of CPR, ensures adequate compressions providing time-to-time feedback to the compressor, and minimizes prolonged compression pauses. The team leader in the meantime focuses on holistic care of the patient. CPR coach role can be incorporated into one of the existing team roles, for example, the team member responsible for defibrillation may also serve as coach.



## Session 13: OPIOID OVERDOSE AND OPIOID-ASSOCIATED LIFE-THREATENING EMERGENCY

Opioid overdose leading to opioid-associated life-threatening emergency is not just related to addicts but may occur in anyone who takes opioids or has access to opioids. This is important to learn what to do if an opioid overdose is suspected. After ensuring scene safety, rescuer may perform assessment and resuscitation simultaneously, without delaying lifesaving actions.

Signs of an opioid overdose include:

1. Slow, shallow or no breathing
2. Drowsiness or loss of consciousness
3. Blue skin, lips or nails
4. Small, constricted pupils

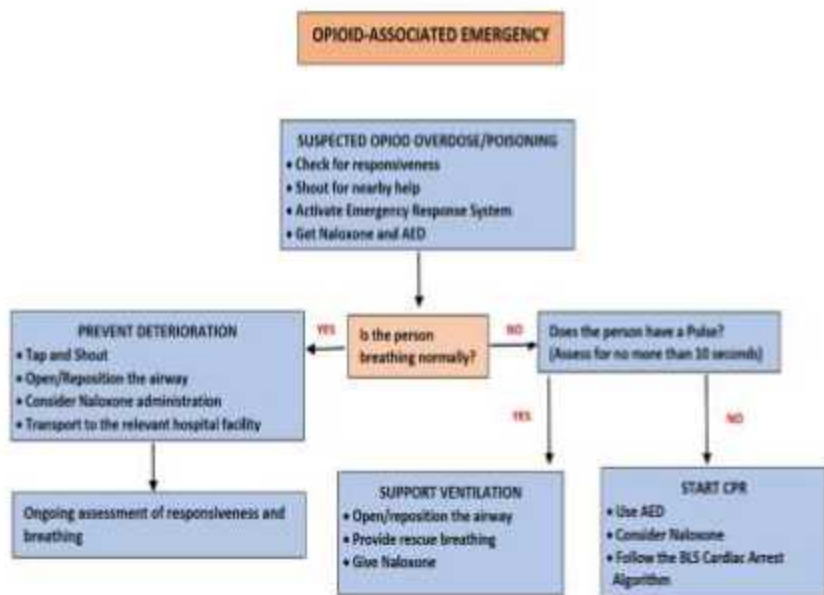
**NALOXONE** - Antidote to opioid overdose

If available, give Naloxone quickly to reverse the opioid-associated respiratory depression.

**Naloxone may be administered using:**

1. Naloxone handheld autoinjector delivering a single intramuscular dose
2. Atomizer device delivering Naloxone intranasally, with no risk of needle-stick injury

STEP	ACTION
1	If you suspect opioid overdose/poisoning <ol style="list-style-type: none"><li>1. Check responsiveness and shout for nearby help</li><li>2. Activate emergency response system</li><li>3. If you are alone, get Naloxone and AED</li><li>4. If someone else is present, send him to get Naloxone and AED</li><li>5. Assess breathing</li></ol>
2	Person is breathing normally. Prevent deterioration <ol style="list-style-type: none"><li>1. Tap and shout 'are you OK'</li><li>2. Open and reposition the airway</li><li>3. Consider administering Naloxone</li><li>4. Transport to the hospital, if out-of-hospital setting</li><li>5. Continue to assess responsiveness and breathing.</li></ol>
3	Person is not breathing normally <ol style="list-style-type: none"><li>1. Assess for presence of Pulse for no more than 10 seconds</li><li>2. If Pulse is present – Support ventilation<ol style="list-style-type: none"><li>i. Open and reposition the airway</li><li>ii. Provide 'Rescue breathing' or Bag-mask ventilation to prevent cardiac arrest</li><li>iii. Reassess breathing and pulse every 2 minutes</li><li>iv. Administer Naloxone</li></ol></li><li>3. If Pulse is not felt or present – Start CPR<ol style="list-style-type: none"><li>i. Start high-quality CPR</li><li>ii. Administer Naloxone</li></ol></li></ol>



## Session 14: BLS & COVID-19

Healthcare workers are the "highest-risk profession" for contracting the coronavirus disease of 2019 (COVID-19). Moreover, resuscitations carries "added risk" for several reasons; (1) CPR involves performing various aerosol-generating maneuvers that may cause viral particles, with a half-life of approximately 1 hour, to remain suspended in the air and be inhaled by bystanders and helpers, (2) resuscitation requires numerous providers to work in close proximity to one another and the patient, and (3) stressful emergent nature of CPR events can result in lapses in infection-control recommendations for the disease. Updated AHA recommendations are designed "to protect not only the patient but also the provider" and involve basic CPR strategies regarding oxygenation and ventilation that differ from standard guidelines for non-COVID19 patients. Prevalence of COVID-19 and its variants, vaccination status, and risk of disease transmission are variable, and individual systems and settings are encouraged to utilize this guidance to match local government and institutional policies.

The guidelines should be applied to patients with suspected or confirmed COVID-19 infection, whereas standard 2020 BLS and CPR algorithms and recommendations for resuscitation continue to apply for patients who are known to be COVID-19 negative.

Use of masks, ventilators, air filtration modules, and other equipment for resuscitation of patient with suspected or confirmed COVID-19 have become essential in the management and prevention of COVID-19 spread. Among various types of air filters, high-efficiency particulate air (HEPA) filters have been recommended (Figure 16).



**Figure 16:** HEPA filter applied to face mask

Healthcare providers can significantly reduce their risk of infection by receiving the vaccine and approved boosters against the SARS-CoV2 virus. There

are no reports yet of chest compressions alone on COVID-19 positive patients resulting in transmission of the virus. For agonal breathing, consider passive oxygenation until high-efficiency particulate air (HEPA) filtered ventilation can be provided. Securely attach a HEPA filter to any ventilation device. Ventilate with a bag-mask-HEPA filter with tight seal until a supraglottic or endotracheal tube is placed. Defibrillate as soon as possible when indicated; do not delay defibrillation for application of mask or other Personal Protective Equipment (PPE). Newborn babies are unlikely to be source of SARS-CoV2 transmission. For newborns, bag-mask or T-piece / mask ventilation with appropriate risk-matched PPE is safe. Maternal respiratory secretions and fluids may be potential source of SARS-CoV2 for the neonatal team and newborn.<sup>1</sup>

In the witnessed sudden arrest, initiate chest compressions immediately and, if not already masked, the provider should don their mask without delaying or interrupting compressions. If immediately available, a face covering for the patient may be considered but should not delay or interrupt compressions.

1. Ventilations that are prioritized in pediatric arrests are suspected to be aerosol generating. Upon arrival, providers wearing appropriate PPE for AGPs should excuse providers without risk-matched PPE.
2. Defibrillate as soon as indicated. Masking of the unvaccinated provider and patient may reduce the uncertain transmission risk following defibrillation but should not prevent or delay defibrillation. Patient masks are not needed if providers are wearing appropriate PPE for AGPs.
3. A HEPA filter should be securely attached to any manual or mechanical ventilation device along the exhalation port before all ventilation devices such as, but not limited to, bag-mask-valve, supraglottic airway devices, endotracheal tubes, and ventilator mechanical circuits. Alternatively, a low-dead space viral filter or a heat and moisture exchanging filter with >99.99% viral filtration efficiency may be placed between the ventilation device and the airway. The viral filter or the heat and moisture exchanging filter should remain attached to the airway when changing ventilation devices.
4. Secure placement of a supraglottic airway with HEPA filters can help maximize chest compression fraction and control aerosol generation before endotracheal intubation.
5. Agonal breathing has been observed during early phases of cardiac arrest and may be seen during resuscitation particularly during transient periods of restored spontaneous circulation. In such cases, consider passive oxygenation overlaid with a surgical facemask (if readily available) when a bag-mask device or an advanced airway with a HEPA filter is not being utilized.
6. Before intubation, ventilate with a bag-mask-HEPA filter and a tight seal using practiced 2-person technique, ideally. The second team member can



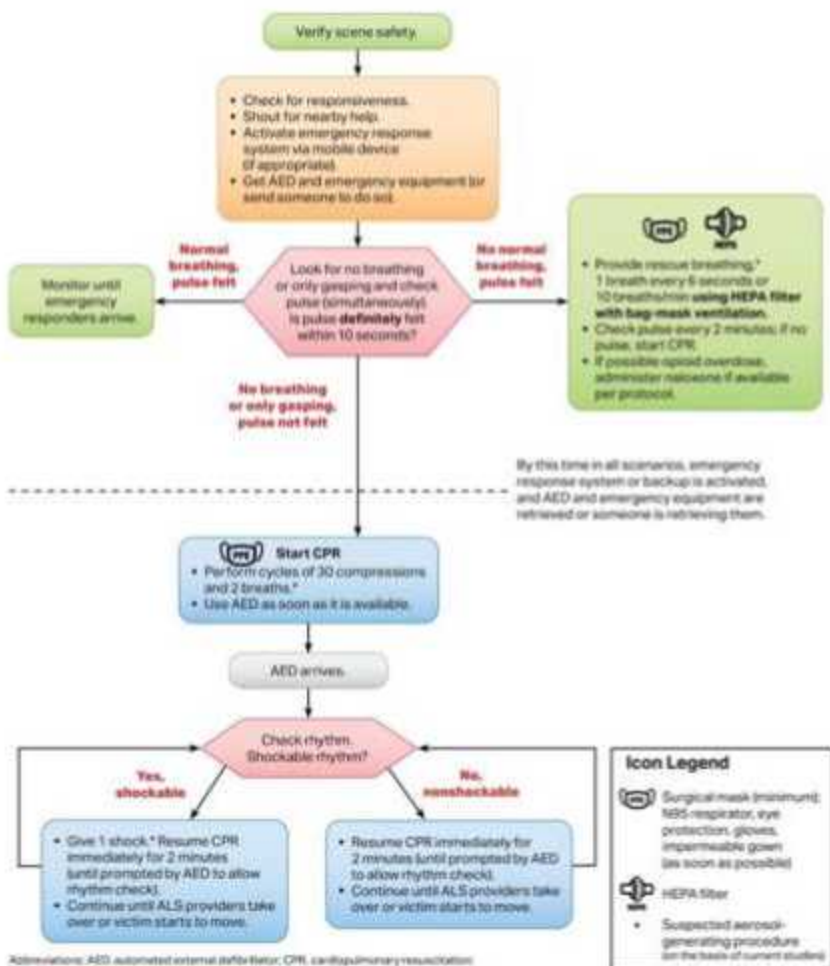
help provide extra support for additional procedures such as compressions once the airway is established.

7. Assign the intubator with the highest chance of first pass success using the method the intubator is most comfortable with while protected with appropriate PPE for AGPs. Intubate with a cuffed endotracheal tube to minimize aerosolization of respiratory particles.
8. Consider use of video laryngoscopy if available and if the operator is experienced with this technique as this may reduce direct exposure of the intubator to respiratory aerosols. Currently, there is no evidence of a difference in transmission risk using video versus direct laryngoscopy in the setting of providers wearing appropriate PPE for AGPs.
9. As in any resuscitation, maximize the chest compression fraction, pausing only to facilitate intubation if needed. Minimizing noncompression time can require team-based instruction including pulse checks, advanced airway placement, and focused ultrasound evaluation coordinated with pulse checks and other necessary interruptions.
10. Avoid endotracheal administration of medications; disconnections may be a source of aerosolization due to unfiltered exhalation.

## REFERENCE

1. Hsu A, Sasson C, Kudenchuk PJ, Atkins D, Aziz K, Becker LB, et al. 2021 Interim Guidance to Health Care Providers for Basic and Advanced Cardiac Life Support in Adults, Children, and Neonates With Suspected or Confirmed COVID-19. *Circ Cardiovasc Qual Outcomes*. 2021 Oct;14(10):e008396. doi: 10.1161/CIRCOUTCOMES.121.008396. Epub 2021 Oct 13.

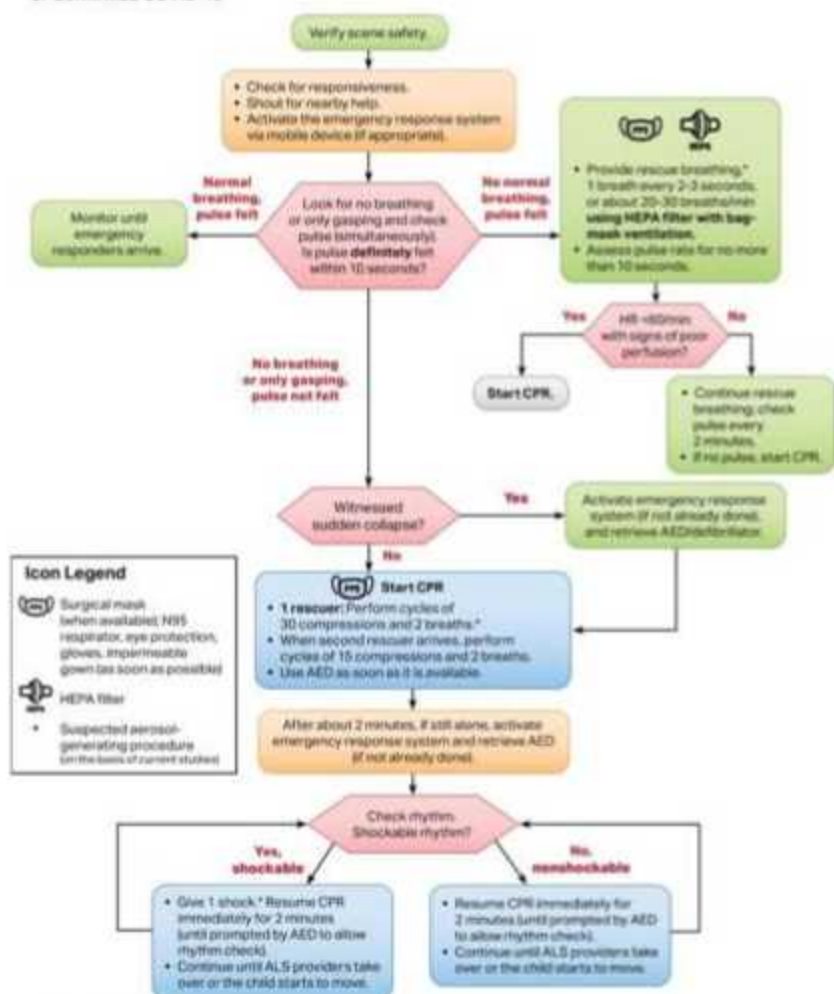
## Adult Basic Life Support Algorithm for Healthcare Providers for Suspected or Confirmed COVID-19



Abbreviations: AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; HEPA, high-efficiency particulate air; PPE, personal protective equipment.

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**Pediatric Basic Life Support Algorithm for Healthcare Provider—Single Rescuer for Suspected or Confirmed COVID-19**



Abbreviations: AED, automated external defibrillator; ALS, advanced life support; CPR, cardiopulmonary resuscitation; HEPA, high-efficiency particulate air; HR, heart rate; PPE, personal protective equipment.

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## Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm for Patients With Suspected or Confirmed COVID-19



### Maternal Cardiac Arrest

- Team planning should be done in collaboration with the obstetric, neonatal emergency, anesthesiology, intensive care, and cardiac arrest services.
- Priorities for pregnant women in cardiac arrest should include provision of high-quality CPR and relief of aortocaval compression with lateral uterine displacement.
- The goal of perimortem cesarean delivery is to improve maternal and fetal outcomes.
- Ideally, perform perimortem cesarean delivery\* in 5 minutes, depending on provider resources and skill sets.

### Advanced Airway

- Rapidly apply PPE before AGPs.**
- In pregnancy, a difficult airway is common. Use the most experienced provider.
- Provide endotracheal intubation or supraglottic advanced airway.
- Perform waveform capnography or capnometry to confirm and monitor ET tube placement.
- For all ventilation, use a HEPA filter.**
- Once advanced airway is in place, give 1 breath every 6 seconds (10 breath/min) with continuous chest compressions.

### Principal Etiology of Maternal Cardiac Arrest

- A Anesthetic complications
- B Bleeding
- C Cardiovascular
- D Drugs
- E Emboli
- F Fetal
- G General nonobstetric causes of cardiac arrest (Sx and Td)
- H Hypertension

Abbreviations: ACLS, advanced cardiovascular life support; AGP, airway-generating procedure; BLS, basic life support; CPR, cardiopulmonary resuscitation; ET, endotracheal; HEPA, high-efficiency particulate air; IV, intravenous; PPE, personal protective equipment; ROSC, return of spontaneous circulation.

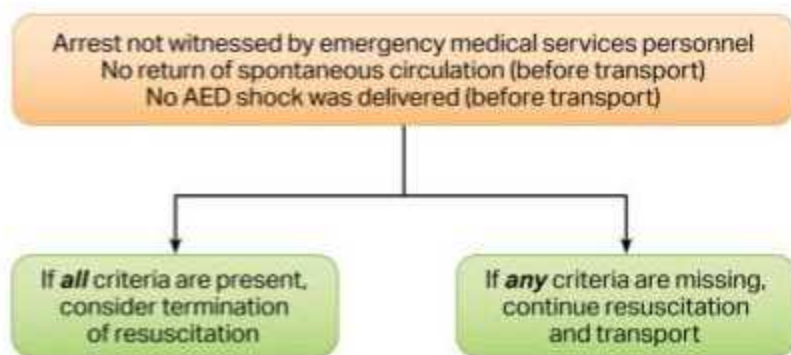
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## Session 20: BLS TERMINATION OF RESUSCITATION (TOR)

Frequent, out-of-hospital cardiac arrest (OHCA) patients are transported to the hospital emergency department for continued resuscitation attempts following full resuscitative efforts by emergency medical services (EMS) in the field and during transport. However, in patients in whom the chance of survival is deemed negligible, terminating resuscitation efforts in the field may be considered. The adoption of termination-of-resuscitation (TOR) rules may reduce unnecessary consumption of valuable resources during emergency transport and in the emergency departments. The basic life support (BLS) TOR rule follows 3 criteria, all of which must be present before terminating resuscitative efforts in an out of hospital cardiac arrest victim:

1. Arrest was not witnessed by EMS personnel
2. No return of spontaneous circulation (ROSC) was observed in the field
3. No shocks were delivered

### BLS Termination of Resuscitation



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## TAKE HOME KEY MESSAGES

1. Recognize the event by assessing responsiveness, breathing and central pulse simultaneously within 10 seconds.
2. Upon recognition of a cardiac arrest event, shout for help, activate the emergency response system, ask for AED, Emergency Equipment and Naloxone, and promptly initiate high-quality cardiopulmonary resuscitation (CPR) using the C-A-B (Compressions-Airway-Breathing) sequence.
3. Start cycles of chest compressions and breaths within 10 seconds of recognition of cardiac arrest.
4. Push hard, push fast: Compress at a rate of 100 to 120/min with a depth of:
  - i. At least 2 inches (5 cm) for adults
  - ii. At least one third the depth of the chest, about 2 inches (5 cm), for children
  - iii. At least one third the depth of the chest, about 1½ inches (4 cm), for infants
5. Allow complete chest recoil after each compression.
6. Minimize interruptions in compressions to less than 10 seconds.
7. Open the victim's airway by head tilt-chin lift or jaw thrust maneuver
8. Provide 2 effective breaths delivering each breath over 1 second, note the chest rise.
9. Provide at least 5 cycles of 30 compressions and 2 breaths before reassessment
10. Use AED for early defibrillation with concurrent high-quality CPR.
11. For patients with non-shockable rhythms, consider early administration of epinephrine with concurrent high-quality CPR.
12. In infants (< 1 year age), for single rescuer, CPR (C-A-B) should be initiated with a ratio of 30 compressions to 2 breaths; for two rescuers, the ratio should be 15 compressions to 2 breaths.
13. In infant, if pulse is present but breathing is not normal, start rescue breathing by providing one breath every 2-3 seconds (20-30 breaths/minute). Keep the infant head in neutral (sniffing) position.
14. In infants, perform a pulse check for no longer than 10 seconds. Activate emergency response system and add chest compressions if the HR remains <60 beats/minute with signs of poor perfusion (Temperature: Cool extremities; Altered mental state: Continued decline in consciousness/responsiveness; Pulses: Weak pulses; Skin: Paleness, mottling (patchy appearance), and later cyanosis)
15. In pregnant woman provide high-quality CPR as for any cardiac arrest victim, with preparation for early perimortem cesarean delivery.
16. In advanced pregnancy ( $\geq 20$  weeks), manually displace the uterus to left side to relieve pressure on great vessels.

17. Early perimortem cesarean delivery may save the infant and improve the chances of successful resuscitation of the mother.
18. Consider and recognize opioid-associated life-threatening emergencies, activate the emergency response system, send someone to bring AED and Naloxone and promptly initiate high-quality CPR with rescue breathing.
19. Consider early administration of Naloxone in opioid-associated life-threatening cardiopulmonary event.
20. Recovery is a critical component of the resuscitation Chain of Survival. Cardiac arrest survivors and their care-givers should receive multimodal rehabilitation assessment and treatment for physical, neurologic, cardiopulmonary, and cognitive impairments before discharge from the hospital.
21. Debriefing is an important component of resuscitation attempt. Debriefing provides the opportunity for team members to identify why certain actions were taken. Debriefing has been shown to:
  - i. Help individual team members perform better
  - ii. Aid in identification of system strengths and deficiencies
22. AHA emphasizes the concept of a 'Chain of Survival' as a coordinated effort used to implement resuscitation science and training. Chain of Survival provides a useful metaphor for the elements of the Emergency Cardiovascular Care (ECC) systems-of-care. Prevention, early recognition and activation of emergency response system, and Recovery have been incorporated as essential component of 2020 in adults and pediatric Chains of Survival.

## APPENDIX 1:

## ADULT CPR SKILLS TESTING CHECKLIST

STUDENT'S NAME \_\_\_\_\_ ROLL NUMBER \_\_\_\_\_ DATE \_\_\_\_\_

SCENARIO: You are working in a hospital and witness a person collapses suddenly in the corridor. The scene is safe. Demonstrate what will you do next.

### ASSESSMENT & ACTIVATION OF EMERGENCY RESPONSE

Checks responsiveness by tapping on shoulders and shouting, "are you O.K.?"

Shouts for help/Activates Emergency Response system/Sends someone to bring AED and Emergency Trolley

Checks breathing

Checks for Carotid Pulse

### CYCLE 1 OF HIGH-QUALITY CPR

#### COMPRESSIONS

Performs high-quality chest compressions

Places hands on lower half of sternum

Provides 30 compressions in no less than 15 and no more than 18 seconds

Compresses at least 2 inches

Allows for complete chest recoil after each compression

Gives breaths

Gives 2 breaths with a barrier device / face mask

Gives each breath over 1 second

Looks for visible chest rise with each breath

Resumes chest compressions in less than 10 seconds

### CYCLE 2 OF HIGH-QUALITY CPR

Compressions

Breaths

Resumes compressions in less than 10 seconds

Second Rescuer arrives with AED.

First rescuer ensures to switch the role and says "I shall use AED; you take over the chest compressions"

### AED

Powers on the AED  Follows the AED commands

Attaches the AED pads correctly

Clears for Analysis  Clears for shock (if advised)

Delivers the shock safely

### RESUMES COMPRESSIONS

Instructs second rescuer to resume compressions / takes over the role of compressor immediately after the shock is delivered

### STOP TEST

#### Test Result

Pass

Needs Remediation

Instructor Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

## APPENDIX 2: CHILD CPR SKILLS TESTING CHECKLIST

STUDENT'S NAME \_\_\_\_\_ ROLL NUMBER \_\_\_\_\_ DATE \_\_\_\_\_

SCENARIO: You are working in a hospital when you hear a woman shouting, "help me, my son is not responding". You have gloves and a pocket mask. You send a healthcare worker to activate the emergency response system and bring the emergency equipment. The scene is safe. Demonstrate what will you do next.

### ASSESSMENT & ACTIVATION OF EMERGENCY RESPONSE

Checks responsiveness by tapping on child's shoulders and asking, "are you O.K.?"

Shouts for help/Activates Emergency Response system/Sends someone to bring AED and Emergency Trolley

Checks breathing

Checks for Carotid/Femoral Pulse

Once student shouts for help and sends somebody to activate emergency response instructor provides the barrier device and says "I am going to activate emergency, get an AED and Emergency Equipment"

### CYCLE 1 OF HIGH-QUALITY CPR (30:2)

CPR feedback devices are helpful for quality check

#### CHILD COMPRESSIONS

Performs high-quality chest compressions

Places hands on lower half of sternum

Provides 30 compressions in no less than 15 but no more than 18 seconds

Compresses at least 5 cm or at least 1/3<sup>rd</sup> the depth of child's chest

Allows for complete chest recoil after each compression

Child's breaths

Gives 2 breaths with a barrier device / face mask

Gives each breath over 1 second

Looks for visible chest rise with each breath

Resumes chest compressions in less than 10 seconds

### CYCLE 2 OF HIGH-QUALITY CPR (Continues steps of Cycle 1)

Compressions  Breaths  Resumes compressions in less than 10 seconds

Second Rescuer arrives with an AED and says, "AED arrived". First Rescuer switches the role saying, "you take over compressions, I shall use AED"

### AED USE

Rescuer 1: Switches the AED 'ON' and FOLLOWS ITS COMMANDS

Correctly applies the AED pads on Child's bare chest

Clears for Rhythm analysis by AED

Clears to deliver shock

Safely delivers the shock

Rescuer 2: Continues chest compressions unless Rescuer 1 stops him/her to clear for AED rhythm analysis

### RESUMES COMPRESSIONS

Rescuer 1: Says to switch the role immediately after delivering the shock and takes over Compressions

Rescuer 2 takes the role for giving breaths in a 30:2 cycle

Test Result Pass

Needs Remediation

INSTRUCTOR NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

### APPENDIX 3: INFANT CPR SKILLS TESTING CHECKLIST

STUDENT'S NAME \_\_\_\_\_ ROLL NUMBER \_\_\_\_\_ DATE \_\_\_\_\_

SCENARIO: You are working in a hospital when you hear a woman shouting, "help me, my baby is not breathing". You have gloves and a pocket mask. You send a healthcare worker to activate the emergency response system and bring the emergency equipment. The scene is safe. Demonstrate what will you do next.

#### ASSESSMENT & ACTIVATION OF EMERGENCY RESPONSE

Checks responsiveness by tapping on the infant's heel and shouting, "baby, baby, are you OK"

Shouts for help/Activates Emergency Response system/Sends someone to bring AED and Emergency Trolley

Checks breathing

Checks for Brachial Pulse on his side

Once student shouts for help and send somebody to activate emergency response and bring necessary equipment, instructor provides the barrier device and instructs to proceed further.

#### CYCLE 1 OF HIGH-QUALITY CPR (30:2)

CPR feedback devices are helpful for quality check

##### INFANT COMPRESSIONS

Performs high-quality chest compressions

Places 2 fingers or 2 thumbs in the center of chest just below the nipple line

Provides 30 compressions in no less than 15 but no more than 18 seconds

Compresses approximately 4 cm or at least  $1/3^{rd}$  the depth of infant's chest

Allows for complete chest recoil after each compression

Gives breaths

Gives 2 breaths with a barrier device / face mask

Gives each breath over 1 second

Looks for visible chest rise with each breath

Resumes chest compressions in less than 10 seconds

#### CYCLE 2 OF HIGH-QUALITY CPR (Continues steps of Cycle 1)

Compressions

Breaths

Resumes compressions in less than 10 seconds

Second Rescuer arrives with a bag-mask device and provides ventilations, whereas 1<sup>st</sup> Rescuer continues compressions with 2 thumb-encircling method

#### CYCLE 3 OF HIGH-QUALITY CPR

##### Rescuer 1: COMPRESSIONS

Performs high quality compressions

Provides 15 chest compressions with 2 thumb-encircling method

Provides 15 chest compressions in no less than 7 and no more than 9 seconds

Compresses approximately 4 cm or at least  $1/3^{rd}$  the depth of infant's chest

Allows for complete chest recoil after each compression

Rescuer 2: Provides 2 breaths with infant bag-mask device (this rescuer is not evaluated)

#### CYCLE 4 OF HIGH-QUALITY CPR

##### Rescuer1: INFANT BREATHS

GIVES 2 BREATHS WITH A BAG-MASK DEVICE

Gives each breath over 1 second

Looks for visible chest rise with each breath

Ensures that compressions are resumed within 10 seconds

Rescuer 2: Provides high-quality compressions (this rescuer is not being evaluated)

Test Result

Pass

Needs Remediation

INSTRUCTOR NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_





Fatima Jinnah Medical University, Lahore - Pakistan