

Current Changes in Adult Basic Life Support: Based on Recent Guidelines of AHA

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Abstract:

Maintenance of tissue oxygen supply is vital for life, and establishing and keeping an open airway is a critical first step when caring for an unconscious or non breathing person. Airway obstruction impedes or prevents oxygen delivery to our lungs, which then prevents delivery to our blood and subsequently to tissues. When oxygen supplies are interrupted, our organs will suffer and eventually die. Clinical death occurs when breathing stops and the heart stops beating. A person without a heartbeat is clinically dead. Because permanent brain damage does not begin for 4 to 6 minutes, clinical death is reversible with immediate care and intervention. Biological death occurs when the brain becomes irreversibly damaged, which occurs after about 8 to 10 minutes without oxygen. This is also called "brain death. The need for immediate action, Basic Life Support, is therefore crucial. Many countries have guidelines on how to provide basic life support (BLS) which are formulated by professional medical bodies in those countries. These guidelines covers the management of a number of conditions, such as cardiac arrest, choking and drowning. The goal of CPR is not to restart the heart but to provide critical blood flow to the heart and brain and to keep oxygenated blood circulating. CPR delays damage to vital organs such as the brain and improves the chances of successful defibrillation[1].

Keywords: Adult basic life support, Recent guidelines, American Heart Association

1. INTRODUCTION

According to the World Health Organization, cardiovascular diseases are the most common cause of death worldwide and account for about one-third of deaths[2]. Among the cardiovascular diseases, Cardiac arrest remains a leading cause of mortality worldwide. It is estimated that about 40-50% of all cardiovascular deaths are sudden cardiac deaths (SCDs) and about 80% of these are caused by ventricular tachyarrhythmias [3]. As per the American Heart Association's newly released Heart Disease and Stroke

Statistics - 2018 Update, there are more than 356,000 out-of-hospital cardiac arrests annually in the U.S and nearly 90% of them fatal [4].

Overall survival rate after an OHCA(out-of-hospital cardiac arrests) has been reported to be very poor in many research studies[5]. Poor survival emphasizes the need to standardize EMS systems, initiate public awareness programs and strengthen links in the chain of survival as per the findings [6]. Since these deaths usually occur without any warning signs, and their survival rates will drastically decrease if treatment isn't received within minutes of the onset of the cardiac arrest. [7]. Hence the community response to cardiac arrest is critical to saving lives. Therefore the knowledge and practice about Basic life support is inevitable to save the precious life of SCD victims.

Basic life support (BLS) is a level of medical care which is used for victims of life-threatening illnesses or injuries until they can be given full medical care at a hospital. BLS includes psychomotor skills for performing high-quality cardiopulmonary resuscitation (CPR), using an automated external defibrillator (AED) and relieving an obstructed airway for patients of all ages[1]. In contrast to ALS , BLS does not use any drugs or invasive skills. An important change in providing BLS is the availability of the automated external defibrillator or AED. This improve the positive outcomes among SCD victims. Every year there is changes in the BLS algorithm based on the new researches and findings.

2. HISTORY OF CPR

In 1740, Paris Academy of Sciences first formally recommended mouth-to-mouth resuscitation for near-drowning victims. After almost 100 years later 1891, the first documented and effective chest compression in humans was performed by Dr. Friedrich Maass. Through the years the use of external chest compressions in human resuscitation was attempted and analyzed, and it was proven that expired air by a rescuer is sufficient to oxygenate an unresponsive

person. CPR was then officially developed and instituted in 1960, and a program by the American Heart Association (AHA) provided CPR training and encouraged the use of CPR by the general public. The American Red Cross and other agencies came on board to institute performance standards, standardized training, and certification for CPR for intervention of sudden cardiac arrest and acute life-threatening cardiopulmonary problems. Every five years the AHA guidelines for CPR and emergency cardiac care are reviewed, improved, and updated to improve survival rates of life-threatening events. AHA establishes these guidelines with the cooperation of other organizations, peer-reviewed studies, and other systematic evidence-based study and review[8].

3. DEFINITION

Basic Life Support (BLS) is defined as “maintaining airway patency and supporting breathing and the circulation without the use of equipment other than a protective device” [Resuscitation Council UK]

4. COMPONENTS OF CPR

Chest compression

Airway

Breathing

Defibrillation

5. ADULT BASIC LIFE SUPPORT FOR A CARDIAC ARREST VICTIM

Basic life support consists of the following sequence of actions: The sequence of Adult basic life support which I have mentioned here is based on the latest guideline of AHA[9].

5.1. Make Sure The Victim, Any Bystanders, And You Are Safe.

Use your senses to obtain an initial impression about the illness or injury before you reach near the patient and try to find out what may be wrong. Check the surroundings, which is unsafe to you, for the bystanders and for the victim, like traffic, fire, escaping steam, downed electrical lines, smoke, extreme weather or even overly emotional bystanders that could become a threat. Quickly collect the information from the bystanders what happened to the victim. Take a complete 360-degree view of the scene to identify any dangers, if so[10].

5.2. Check The Victim For A Response.

For checking the response, speak loudly to the patient by patting lightly over the shoulder and ask ‘Are you all right?’

If he responds:

If there is no dangers, leave him in the position in which you find him and ask to the bystanders, if there is any, about the reason for this incident. Reassess him regularly until he became comfortable. Look for any other warning signs of circulatory collapse like abnormal skin color, heavy bleeding . If there is bleeding try to control it by giving pressure over the site. Reassure him/her if the patient is responding to your questions[11].

If he does not respond:

If there is no response from the patient , you have to immediately assess the patient for breathing and pulse.

5.3. Assess Breathing And Pulse

To minimize the delay in beginning chest compression, you have to scan the chest for rise, while checking the carotid pulse. For checking breathing and pulse, you should not take more than 10 seconds[12]. If the victim is breathing normally, monitor the patient until getting advance life support. But if the patient is not breathing or only gasping should be considered as absent breathing. For checking the pulse you have to palpate carotid artery [palpate the trachea and sterno-cleido mastoid muscle at the side of the victim’s neck after turning the neck to one side provided there should not be any spinal cord injury.]. You should not spend more than 10 seconds for checking carotid pulse if you are not feeling a definite pulse. When checking for the pulse and breathing, if the victim is having pulse and no breathing or an agonal breathing (Agonal breaths are isolated or infrequent gasping that occurs in the absence of normal breathing in an unconscious patient. These breaths can occur after the heart has stopped beating and are considered a sign of cardiac arrest.) , then you have to provide rescue breathing (Give 1 breath in every 5 to 6 seconds, 10 -12 breaths per minute for an adult patient) until the victim has handed over to the medical team. Make sure the patient is getting adequate oxygen by seeing the chest rise after each breathing. Continue rescue breathing and pulse check in every two minutes. You have to be ready for giving CPR if the pulse get disappeared[13].

5.4. Call For Help

If there is no response or no purposive movement, the person should be determined as unresponsive. After confirming that patient doesn’t have any pulse or breathing, Call for help loudly to get attention from the surroundings[14]. Ask the bystander to activate EMS and to get an AED. If there is nobody you have to make a call to 9-1-1 from your phone.

5.5. Start Chest Compressions

AHA has recommended to start chest compression as early as possible, after confirming the victim is in cardiac arrest. It is recommended to start CPR within 10 seconds after confirming the cardiac arrest. For doing a chest compression, you have to kneel by the side of the victim or standing beside the bed (eg, in-hospital). Because hospital beds are typically not firm and some of the force intended to compress the chest results in mattress displacement rather than chest compression, we have traditionally recommended the use of a backboard despite insufficient evidence for or against the use of backboards during CPR. If a backboard is used, care should be taken to avoid delay in initiation of CPR, to minimize interruptions in CPR, and to avoid line/tube displacement[15]. Air-filled mattresses should be deflated when performing CPR water has to be removed from water mattress in case of water bed.

For giving an effective chest compression, Place the heel of one hand in the centre of the victim's chest (which is the lower half of the victim's sternum (breastbone)). Place the heel of your other hand on top of the first hand. Interlock the fingers of your hands and ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or the bottom end of the sternum. Position yourself vertically above the victim's chest and, with your arms. Do chest compression at a rate of 100 - 120 min or minimum 100/minute. Compress the chest atleast a depth of 2 inches(5 cm). Compressing the chest more than two inches leads to complications rather than benefits. It should not be either shallow or deep . while doing the compression, there should be equal time for both compression and release. You have to push hard and push fast while compressing the chest. There should be hardly any interruptions while doing the chest compression.

5.6. OPENING AIRWAY

After 30 compressions you have to open the airway before giving a rescue breathing to the patient. The two methods which is commonly using to open the airway are Head-tilt/chin-lift technique and Modified jaw-thrust maneuver, if a head, neck or spinal injury is suspected[16].

Head-tilt/chin-lift technique

To perform the head-tilt/chin lift technique on an adult victim, tilt the head by keeping one hand over the forehead while pulling up on the bony part of the chin with two to three fingers of the other hand. For adult victims, tilt the head past a neutral position to open the airway while avoiding hyperextension of the neck.

Modified jaw-thrust maneuver

The modified jaw-thrust maneuver is used to open the airway when a patient is suspected of having a head, neck or spinal injury. To perform this maneuver on an adult, kneel above the patient's head and Put one hand on each side of the patient's head with the thumbs near the corners of the mouth pointed toward the chin, using the elbows for support. Slide the fingers into position under the angles of the patient's jawbone without moving the head or neck. Thrust the jaw upward without moving the head or neck to lift the jaw and open the airway. After opening the airway start to give rescue breathing.

5.7. Provide Rescue Breathing

If there is no normal breathing, Deliver each breath for one second. Two breaths has to be given after 30 chest compressions. Check for the chest rise while giving the breathing to the victim and confirm the patient is getting oxygen. These actions should not be taken more than 10 seconds to avoid the interruptions while providing CPR. There are mainly four types of oxygen administration.

Mouth-to-Mouth Rescue Breathing

To provide mouth-to-mouth rescue breaths, open the victim's airway, pinch the victim's nose, and create an airtight mouth-to-mouth seal. Give 1 breath over 1 second, take a "regular" (not a deep) breath, and give a second rescue breath over 1 second.

Mouth to nose method

The mouth to nose technique is performed like mouth to mouth breathing, except that you force your exhaled breath through the victims nose while holding his or her mouth closed with one hand by pushing up on the chin. Then hold the victims mouth open so any nasal obstruction does not impede exhalation of air from the victims lungs.

Mouth to stoma method

In mouth to stoma rescue breathing the victims mouth and nose must be closed during the delivery of breaths because the air can flow upward in to the lungs. You can close the victims mouth and nose with one hand.

Mouth-to-Barrier Device Breathing

A mouth to barrier device is an apparatus that is placed over a victims face as a disease prevention for the rescuer during rescue breathing masks resuscitation masks cover the victims mouth and nose. Most have a one way valve so exhaled air from the victims does not enter in rescuers mouth.

If the initial rescue breath of each sequence does not make the chest rise as in normal breathing, then, before your next attempt , Check the victim's mouth and

remove any visible obstruction and recheck that there is adequate head tilt and chin lift. Do not attempt more than two breaths each time before returning to chest compressions. If there is more than one rescuer present, another should take over CPR about every 1-2 min to prevent fatigue. Ensure the minimum of delay during the changeover of rescuers, and do not interrupt chest compressions. Continue with chest compressions and rescue breaths in a ratio of 30:2. For giving a cycle of 30 compressions and 2 breath the rescuer should not take more than 15-20 seconds. The rate of compression is a 100-120/minute. Stop to recheck the victim only if he starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully and starts to breathe normally; otherwise do not interrupt resuscitation.

5.8. Use AED As Soon As It Is Available

An AED, or automated external defibrillator, is a device that has the ability to detect and treat, through electrical energy, the lethal arrhythmias known as ventricular fibrillation and ventricular tachycardia[17]. The steps to use an AED are as follows:

1. Open the packet and turn on the AED.
2. Remove or cut away clothing and undergarments and expose the bare chest.
3. Remove any objects that could come into contact with the pads.
4. Dry chest skin if it is wet . Dry skin helps the AED pads to stick properly.
5. Small amounts of chest hair will not interfere with pad adhesion. If the person has thick chest hair, shave the areas before the pads are applying on the particular areas.
6. If the person has an implanted pacemaker, Apply the AED pads approximately 2.5 cm (1 in.) away from the pacemaker.
7. Apply the AED pads over the chest: Use the appropriate size of pads—adult, child, or baby. .
8. Follow the diagrams on the pads to position them correctly on the person.
9. Pads must be placed at least 2.5 cm apart. If there is not enough space on the chest to leave 2.5 cm (1 in.) between the pads, place one pad on the person's chest (anterior) and one on the person's back (posterior).
10. After placing the pads over the chest , follow the instructions which is given by AED. Most AEDs will begin to analyze the heart rhythm automatically, but some may require you to press an "analyze" button to start this process.

11. No one should touch the person while the AED is analyzing the heart rhythm because this could result in a faulty reading.
12. If the AED prompts you to do so, deliver the shock: Stand clear and say "I'm clear, you're clear, everybody's clear."
13. Ensure that no one is touching the person (as they can be shocked too), then press the "shock" button.
14. After a shock is delivered (or if the AED determines that no shock is necessary), immediately resume CPR, starting with compressions.
15. Continue to follow the AED's automated prompts.

5.9. Continue Resuscitation Until:

- Qualified help arrives and takes over,
- The victim starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully and starts to breathe normally, or
- You become exhausted.
- An AED is ready to analyze the patient's heart rhythm.
- The scene becomes unsafe.

6. MANAGEMENT FOR A CHOKING VICTIM

Airway obstructions are a common emergency. You need to be able to recognize that a patient who cannot cough, speak, cry or breathe requires immediate care. Airway obstructions can lead to respiratory and even cardiac arrest if not addressed quickly and effectively. A conscious person who is clutching the throat is showing what is commonly called the universal sign for choking. However, in many cases a patient will just panic.



Figure 1. Universal sign for choking

6.1. Adult Choking Treatment Algorithm

If the victim shows signs of mild airway obstruction:

Encourage him to cough, but do nothing else. If the obstructive object is visible from outside, try to remove it with your gloved finger

If the victim shows signs of severe airway obstruction and is conscious:

Give up to five back blows. For giving a back blow you have to Stand to the side and slightly behind the victim. Support the chest with one hand and lean the victim well forwards. so that when the obstructing object is dislodged it comes out of the mouth rather than goes further down the airway. Give up to five sharp blows between the shoulder blades with the heel of your other hand. The aim is to relieve the obstruction with each blow rather than necessarily to give all five. If five back blows fail to relieve the airway obstruction give up to five abdominal thrusts. If the object is not coming out with five back blows do abdominal thrust. For giving an abdominal thrust, Stand behind the victim and put both arms round the upper part of his abdomen. Lean the victim forwards. Clench your fist and place it between the umbilicus (navel) and the bottom end of the sternum (breastbone). Grasp this hand with your other hand and pull sharply inwards and upwards. Repeat up to five times. If the obstruction is still not relieved, continue alternating five back blows with five abdominal thrusts. In case of pregnant women and for a obese victim , you have to try Chest thrust other than abdominal thrust as it leads to injury to internal organs in abdominal cavity[17]. For giving a chest compression you have to stand behind the person and wrap both of your arms around the person's chest, just under the armpits. Make a fist and place it in the middle of the person's chest, with your thumb facing inward, and place your other hand over your fist. Give up to 5 thrust by pulling straight back toward you. If you find your thrusts are not effective, pull more sharply and deeply.

If the victim becomes unconscious:

If the victim becomes unconscious, activate the emergency response system or send someone to make a call to 9-1-1. If there is nobody around, you have to leave the patient after two minutes of CPR to call for help. Thereafter you have to place the victim over the floor or a firm surface and begin CPR. Start chest compression at first, before you deliver breath to the

victim you have to check for a foreign body in his mouth. If you see a foreign body that can be easily removed, remove it with your gloved finger and continue CPR until advanced providers arrive.

7. CONCLUSION

According to sudden cardiac arrest associations, It has been estimated that SCD claims more than 7,000,000 lives per year worldwide . It is proved that Effective basic life support giving soon after cardiac arrest doubles the chance of survival. Hence updating the knowledge regarding basic life support will be very vital to save the life of cardiac arrest victims.

Table 1. Summary of recent changes in adult basic life support

SUMMARY OF RECENT CHANGES IN ADULT BASIC LIFE SUPPORT	
Compression rate	100-120/minute ; 30 compression in 15-18 seconds
Depth of compression	About 2 inches or atleast 5cm
One cycle	30:2
Hand position	Lower half of the sternum
Breath	Just enough volume to make the chest start to rise (1 second per breath)

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