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# Analysis of Effectiveness and Benefits of Cardiopulmonary Resuscitation

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**Abstract:**

In the discharge of duty as health care worker, instances where cardiopulmonary resuscitation (CPR) will be needed will definitely arise. Adequate knowledge and skills of CPR will reduce mortality rates. Cardiopulmonary resuscitation (CPR) is a life-saving procedure that consists of the use of chest compressions and artificial ventilation to maintain circulatory flow and oxygenation during cardiac arrest. Cardiopulmonary resuscitation (CPR) is a lifesaving technique useful in many emergencies, including a heart attack or near drowning, in which someone's breathing or heartbeat has stopped. It is a lifesaving technique that is used when someone's breathing or heartbeat has stopped.

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## Introduction

Cardiac arrest is an emergency, which can be managed effectively by sound knowledge and practice of basic life support (BLS) skills. However, it has been reported worldwide that the health workers' understanding of healthcare of cardiopulmonary resuscitation (CPR) and BLS is poor and sub-standard (Majid, Jamali & Ashrafi, 2019).

The treatment of sudden cardiac death (SCD) has advanced using cardiopulmonary procedure but in spite of this, it remains a leading cause of death and is responsible for almost half of all deaths from cardiovascular disease. Outcomes continue to remain poor following a sudden cardiac arrest, with most individuals did not survive (Wong, et al, 2019). The skill in the performance of effective CPR is a vital part of successful health care practice.

## Concept of Cardiopulmonary Resuscitation (CPR)

According to the American Heart Association (2015), cardiopulmonary resuscitation (CPR) is an emergency procedure that combines chest compressions often with artificial ventilation in a bid to manually preserve intact brain performance in a person who has cardiac arrest until further measures are taken to restore proper blood circulation and breathing. Cardiopulmonary resuscitation is a combination of actions that should be done to victims of cardiac arrest who stop breathing, or if their heart stops functioning.

Cardiopulmonary resuscitation (CPR) is a technique that is life-saving. In many emergencies including a heart attack or near drowning, it is very useful especially if the person's breathing or heartbeat has stopped. The American Heart Association (2015) submits that everyone, whether untrained health workers or even bystanders should begin CPR with chest compressions. The goal of cardiopulmonary resuscitation is to force oxygenated blood to keep flowing through the body. Every part of the body needs oxygenated blood to survive. CPR does not start a person's heart again. However, it can keep pushing oxygenated blood around the body long enough that sometimes, it can prevent the body from getting damaged by not having enough oxygen. Thus, CPR can keep oxygenated blood flowing to the brain and other vital organs until more definitive medical treatment can restore a normal heart rhythm, and this procedure is recommended in victims who are unresponsive with no breathing or abnormal breathing. It is also done when a person suddenly collapse or is not breathing. (Atkins, Berger, Duff, Gonzales & Hunt, 2015).

Cardiopulmonary resuscitation involves chest compressions for adults between 5 cm (2.0 in) and 6 cm (2.4 in) deep and at a rate of at least 100 to 120 per minute. That is, do chest compressions (press hard and fast in the middle of the chest, on the breastbone, until help comes; this will force blood to keep flowing to the body) (Neumar, Shuster, Callaway, Gent & Atkins, 2015). The rescuer may also provide artificial ventilation by either exhaling air into the subject's mouth or nose (i.e. mouth-to-mouth resuscitation) or using a device that pushes air into the subject's lungs (i.e. mechanical ventilation). Current submissions place emphasis on early and high-quality chest compressions over artificial ventilation; a simplified Cardiopulmonary resuscitation method involving chest compressions only is recommended for untrained rescuers (Leong, 2011). Atkins, *et al.*, (2015) revealed that in children, however, only doing compressions may result in worse outcomes, because in children the problem normally arises from a respiratory, rather than cardiac problem. Chest compression to breathing ratios is set at 30 to 2 in adults.

According to Werman, Karren and Mistovich (2014), Cardiopulmonary resuscitation alone is unlikely to restart the heart. Its main purpose is to restore partial flow of oxygenated blood from the heart and to the brain. The objective is to delay brain's damage and to extend the brief window of opportunity for a successful resuscitation without permanent brain damage. Administration of an electric shock to the subject's heart, (i.e defibrillation), is usually needed in order to restore a viable or "perfusing" heart rhythm. Defibrillation is effective only for certain heart rhythms, such as ventricular fibrillation activity. Early shock when appropriate is recommended. In general, Cardiopulmonary resuscitation is continued until the person is resuscitated or is pronounced certified dead (Werman, Karren & Mistovich, 2014).

Poor knowledge of CPR among health workers portends a great danger to community health. To achieve the goal of improving the survival rate from cardiac arrest, there is an urgent need to train healthcare givers on CPR and BLS techniques (Owojuyigbe, Adenekan, Faponle & Olateju, 2015). Also, as healthcare workers, especially nurses who are usually the first professional persons to provide BLS during emergency situations, they should possess the knowledge, attitude and skills to be able to perform CPR effectively and thus save lives (Ehlers & Rajeswaran, 2014). In addition, the quality of CPR mainly depends on the adequacy of the skill, attitude, and knowledge, attitude and skill of health workers who deliver CPR. Doubling the survival of patients from cardiopulmonary arrest requires improvement in resuscitation education (Gebremedhn, Gebregergs, Anderson & Nagaratnam, 2017).

The attitude of the community to this important subject, cardiopulmonary resuscitation will greatly determine how they can benefit from it (Onyeaso & Onyeaso, 2016). In addition, the skill in the performance of effective cardiopulmonary resuscitation is an essential part of successful healthcare practice. For effective bystander cardiopulmonary resuscitation (CPR), retention of CPR skills and attitude after the training is central. The teaching of cardiopulmonary resuscitation (CPR) skills among the healthcare workers should be encouraged (Onyeaso, 2016).

**Medical uses of Cardiopulmonary Resuscitation**

According to Onyeaso and Onyeaso (2016), cardiopulmonary resuscitation is indicated for any person who is not responding by breathing or who is only breathing in occasional agonal gasps, as it is most likely that they are in cardiac arrest. If a person still has pulse rate but is not breathing (respiratory arrest) artificial ventilations may be more appropriate, but, due to the difficulty people have in accurately assessing the presence or absence of a pulse, cardiopulmonary resuscitation guidelines recommend that lay persons should not be instructed to check the pulse, while giving healthcare professionals the option to check a pulse. In those with cardiac arrest due to trauma, cardiopulmonary resuscitation is considered unfruitful but still recommended. Correcting the underlying cause such as a tension pneumothorax or pericardial tamponade may help.

**Steps of CPR**

Before starting CPR, check if the environment is safe for the person? Is the person conscious or unconscious? If the person appears unconscious, tap or shake his or her shoulder and ask loudly, "Are you OK?" If the person doesn't respond and two people are

available, have one person call the local emergency number and get the automated external defibrillator (AED), if one is available, and have the other person begin CPR. If you are alone and have immediate access to a telephone, call your local emergency number before beginning CPR. Get the automated external defibrillator (AED), if one is available. As soon as an AED is available, deliver one shock if instructed by the device, then begin CPR (Neumar, 2015).

The American Heart Association (2015) uses the letters CAB – compressions, airway, and breathing, to help people remember the order to perform the steps of CPR.

Put the person on his or her back on a firm surface.

Kneel next to the person's neck and shoulders. Place the heel of one hand over the center of the person's chest, between the nipples. Place your other hand on top of the first hand. Keep your elbows straight and position your shoulders directly above your hands.

Use your upper body weight (not just your arms) as you push straight down on (compress) the chest at least 2 inches (approximately 5 centimeters) but not greater than 2.4 inches (approximately 6 centimeters). Push hard at a rate of 100 to 120 compressions a minute.

If you haven't been trained in CPR, continue chest compressions until there are signs of movement or until emergency medical personnel take over. If you have been trained in CPR, go on to opening the airway and rescue breathing.

If you're trained in CPR and you've performed 30 chest compressions, open the person's airway using the head-tilt, chin-lift maneuver. Put your palm on the person's forehead and gently tilt the head back. Then with the other hand, gently lift the chin forward to open the airway.

Rescue breathing can be mouth-to-mouth breathing or mouth-to-nose breathing if the mouth is seriously injured or can't be opened.

With the airway open (using the head-tilt, chin-lift maneuver), pinch the nostrils shut for mouth-to-mouth breathing and cover the person's mouth with yours, making a seal.

Prepare to give two rescue breaths. Give the first rescue breath, lasting one second and watch to see if the chest rises. If it does rise, give the second breath. If the chest doesn't rise, repeat the head-tilt, chin-lift maneuver and then give the second breath. Thirty chest compressions followed by two rescue breaths is considered one cycle. It is also good to be careful not to provide too many breaths or to breathe with too much force.

Resume chest compressions to restore circulation.

As soon as an automated external defibrillator (AED) is available, apply it and follow the prompts. Administer one shock, then resume CPR, starting with chest compressions — for two more minutes before administering a second shock. If you're not trained to use an AED, other emergency medical operator may be able to guide you in its use. If an AED isn't available, go to step 5 below (The American Heart Association, 2015). Continue CPR until there are signs of movement or emergency medical personnel take over (The American Heart Association, 2015).

**Effectiveness of Cardiopulmonary Resuscitation**

Sarver Heart Center (2013), highlighted that cardiopulmonary resuscitation oxygenates the body and brain for defibrillation and advanced life support. Even in the case of a "non-shockable" rhythm, such as pulseless electrical activity (PEA) where defibrillation is not indicated, effective cardiopulmonary resuscitation is no less important. If it is used alone,

cardiopulmonary resuscitation will result in few complete recoveries, though the outcome without cardiopulmonary resuscitation is almost uniformly fatal. CPR can keep oxygenated blood flowing to the brain and other vital organs until more definitive medical treatment can restore a normal heart rhythm. CPR, especially if performed immediately, can double or triple a cardiac arrest victim's chance of survival.

A study conducted by Public Health - Seattle; King County (2013),has revealed that immediate CPR followed by defibrillation within 3–5 minutes of sudden ventricular failure cardiac arrest dramatically improves survival. Similarly, Merchant, Berg, Yang, Becker and Groeneveld, (2014) posited that in-hospital cardiopulmonary resuscitation is more successful when arrests are witnessed or are in the ICU or in patients wearing heart monitors, where the arrests are noticed immediately.

Zhan, Yang, Huang and He (2017), reported that in adults compression-only CPR by bystanders appears to be better than chest compressions with rescue breathing. Compression-only CPR may be less effective in children than in adults. In a 2010 prospective study of cardiac arrest in children (age 1–17) for arrests with a non-cardiac cause, provision by bystanders of conventional CPR with rescue breathing yielded a favorable neurological outcome at one month more often than did compression-only CPR (Odds Ratio = 5.54). For arrests with a cardiac cause in this cohort, there was no difference between the two techniques (Odds Ratio = 1.20) (Kitamura, et al,, 2010).

Zhan, et al., (2017) reported that when done by trained responders, 30 compressions interrupted by two breaths appear to have a slightly better result than continuous chest compressions with breaths being delivered while compressions are ongoing.

**Benefits of Cardiopulmonary Resuscitation**

CPR performance is advised as a last resort intervention, for when a person is not breathing and therefore would certainly die without it (The American Heart Association, 2015). According to a study conducted by Benjamin, et al. (2019), in US hospitals in 2017, 26% of patients who received cardiopulmonary resuscitation survived to hospital discharge. Since 2003, widespread cooling of patients after cardiopulmonary resuscitation and other improvements have raised survival and reduced mental disabilities.

Organ donation is usually made possible by cardiopulmonary resuscitation, even if cardiopulmonary resuscitation does not save the patient. If the patient does not achieve return of spontaneous circulation, and cardiopulmonary resuscitation continues until an operating room is available, the kidneys and liver can still be considered for donation (ECC Guidelines, 2015). Orioles, Morrison and Rossano (2013), reported that 1,000 organs per year in the US are transplanted from patients who had cardiopulmonary resuscitation.

For CPR outside hospitals, a study conducted by Soholm, et al. (2014), in Copenhagen among 2,504 patients in 2007-2011 found 21% of survivors developed moderate mental problems but could still be independent, and 11% of survivors developed severe mental problems, so they needed daily help. Two patients out of 2,504 went into comas (0.1% of patients, or 2 out of 419 survivors, 0.5%), and the study did not track how long the comas lasted.

Injuries from cardiopulmonary resuscitation vary. In a study conducted by Boland, Satterlee, et al. (2015), it was reported that majority (87%) of patients are not injured by cardiopulmonary resuscitation. Overall, injuries are caused in 13% of patients, including

broken sternum or ribs (9%), lung injuries (3%), and internal bleeding (3%). The internal injuries counted here can include heart contusion, hemopericardium, upper airway complications, damage to the abdominal viscera (such as lacerations of the liver and spleen), fat emboli, pulmonary complications (like pneumothorax, hemothorax, lung contusions).

Most injuries did not affect care; only 1% of those given cardiopulmonary resuscitation received life-threatening injuries from it. Also, broken ribs are present in 3% of those who survive to hospital discharge, and 15% of those who die in the hospital, for an average rate of 9%. The type and frequency of injury can be influenced by factors such as sex and age (Boland, *et al.*, 2015). The most common side effect is vomiting, which necessitates cleaning the mouth so patients do not breathe it in.

## Conclusion

Cardiopulmonary resuscitation (CPR) is an emergency procedure that combines chest compressions often with artificial ventilation in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person who is in cardiac arrest. Cardiopulmonary resuscitation is a set of actions that should be done if a person stops breathing, or if their heart stops. Cardiopulmonary resuscitation (CPR) is a lifesaving technique useful in many emergencies, including a heart attack or near drowning, in which someone's breathing or heartbeat has stopped. It is a lifesaving technique that is used when someone's breathing or heartbeat has stopped.

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