Research Article *http://dx.doi.org/10.4314/mejs.v18i2.4* ***Open Access***

Efficacy of Medical Care on Cardiac Arrest in Patients Based on Clinical Points and Cardiopulmonary Resuscitation

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ABSTRACT

In the present study, the efficacy of medical care on cardiac arrest in patients, based on clinical points and cardiopulmonary resuscitation (CPR), was investigated. For this, 46 published articles between 2013 and 2024 were evaluated with keywords including "medical care," "emergency medicine unit, and clinical points and cardiopulmonary resuscitation," searched in Scopus, Google Scholar, and PubMed databases. A resuscitation operation maintains blood flow to the important organs of the body. The chain of rescue defined by the American Heart Association (AHA) includes recognition of cardiac arrest and activation of 115, rapid initiation of cardiac massage, and continuing advanced resuscitation in the hospital. Many cases of cardiopulmonary arrest can be reversed by performing rapid and correct cardiopulmonary resuscitation. The likelihood of survival is significantly greater when an observer performs CPR compared to when CPR is not performed, and this approach is equally effective as full CPR during the initial minutes.

Keywords: Medical Care, Emergency Medicine Unit, Clinical Points, Cardiopulmonary Resuscitation.

1. INTRODUCTION

Advanced cardiopulmonary resuscitation (*ACLS*) is a set of measures that are used in order to resuscitate the heart and lungs of patients. The goal of *CPR* is to restart the heart and maintain circulation and oxygenation until advanced medical help arrives. The results of a recent study showed that there is no need to breathe in the resuscitation of adults and cardiac massage is strongly recommended. The American Heart Association strongly recommends hands-only *CPR* and the massage should continue until the emergency personnel arrive and bring the AED device to the bedside. Cardiopulmonary or *CPR* is a method to save the life of people who have lost the power

Momona Ethiopian Journal of Science (MEJS), V18(2):221-233, 2026 ©CNCS, Mekelle University, ISSN:2220-184X
Submitted: 31st January 2026 Accepted: 23rd September 2026 Published: 29th October 2026

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to react or breathe or are not breathing normally (Yannopoulos et al., 2020; Bartos et al., 2020). Cardiopulmonary arrest (*CPA*) is the cessation of effective ventilation and circulation. It is also known as cardiac arrest or circulatory arrest. In adults, it is most likely to be caused by a primary cardiac event. The most common electrical mechanism which is responsible for 50 to 80% of cardiopulmonary arrest is ventricular fibrillation (*VF*). While, 20^% to 30% which represents the less common causes of dysrhythmias involve Pulseless electrical activity (*PEA*), and asystole. Pulseless sustained ventricular tachycardia is a less common mechanism. This condition could progress to sudden death if it not treated promptly. Nevertheless, a cardiopulmonary arrest could be reversed by cardiopulmonary resuscitation and/or cardioversion or defibrillation, or cardiac pacing (Patel and Hipskind, 2023).

According to the Resuscitation Council UK, the annual incidence of out-of-hospital cardiac arrest (*OHCA*) is approximately 55 per 100,000 population (Važanić et al., 2022), while the annual incidence of in-hospital cardiac arrest (*IHCA*) is 1–1.5 per 1000 hospital admissions (Barros and Enfield, 2023). Bystander CPR is attempted in 7 out of 10 cases of OHCA. The average ambulance response time is reported as 6.9 minutes (Mitropoulou and Fitzsimmons, 2022). The prognosis of *OHCA* is very poor even when prompt bystander resuscitation is attempted, as only about 9% of patients survive to hospital discharge after *OHCA*. The statistics are somewhat better for *IHCA*, as approximately a quarter (23.6%) of those who are treated by the hospital's resuscitation team survive to hospital discharge (Nolan et al., 2024). In a separate study, Peddy et al. (2007) studied cardiopulmonary resuscitation with special considerations for infants and children with cardiac disease. The results showed that overall survival of those receiving cardiopulmonary resuscitation was 46%. Survival was better for those receiving cardiopulmonary resuscitation after cardiac surgery, at 53%, compared with survival of 33% for pre-operative or non-surgical patients undergoing resuscitation. Clearly there is room for improvement in outcomes from cardiac resuscitation in children with cardiac disease. In this review, therefore, we summarize the newest developments in paediatric resuscitation, with an expanded focus upon the unique challenges and importance of anticipatory care in infants and children with cardiac disease. In another study, Migdady et al. (2020) focused on brain injury and neurologic outcome in patients undergoing extracorporeal cardiopulmonary resuscitation. They found that one in four patients developed acute brain injury after extracorporeal cardiopulmonary resuscitation and the most common type was hypoxic-ischemic brain injury. One in four extracorporeal cardiopulmonary resuscitation

patients achieved good neurologic outcome. Alsoufi et al. (2007) studied survival outcomes after rescue extracorporeal cardiopulmonary resuscitation in pediatric patients with refractory cardiac arrest. The results indicated that acceptable survival and neurologic outcomes (30%) can be achieved with extracorporeal cardiopulmonary resuscitation in children after prolonged cardiac arrest (up to 95 minutes) refractory to conventional resuscitation measures. Heart transplantation is often needed for successful extracorporeal cardiopulmonary resuscitation exit strategy. Lack of predictors of poor outcome support aggressive attempts to initiate extracorporeal cardiopulmonary resuscitation in all patients. In developed countries, the survival rate of cardiac arrest that occurs in the hospital and outside is less than 30% and less than 10%, respectively. The survival rate due to out-of-hospital cardiac arrest varies from 2% to 26%. Reports on the success rate of cardiopulmonary resuscitation are varied and vary widely. 2 to 0.27% in hospital cardiac arrests and 0.2 to 10% in out-of-hospital cardiac arrests have been reported (Bauer et al., 2022). In this study, we aimed to study the efficacy of medical care on cardiac arrest in patients based on clinical points and cardiopulmonary resuscitation

2. METHODOLOY

In the current study, 46 articles published between 2013 and 2024 were reviewed using key words such as "Nursing Services", "Medical care", "Emergency Medicine Unit", "Clinical Points and Cardiopulmonary Resuscitation" in international databases such as MEDLINE (PubMed and Ovid), Web of Science, and Scopus. The keywords were standardized in Mesh and used for searching. In addition, the reference list of the selected articles was screened to find relevant studies. The search strategy was as follows, at first, a list of titles and abstracts of all articles searched in the databases under review was prepared. This work was done independently by two researchers. Then articles with duplicate titles were removed. Next, the abstracts of the articles were checked to find suitable studies, all the searched studies were saved in the EndNote. X8 software, and the rest of the steps were performed by the software (Fig 1).

3. RESULTS

The initial search identified 46 articles. In the first phase, 12 articles were eliminated due to duplicate records based on article titles. Studies that did not meet the inclusion criteria were excluded by reviewing the abstracts of 34 articles in the second step (n = 17). In the third step, 11

articles with incomplete data or non-compliance with the inclusion and exclusion criteria were eliminated after examining the full texts of 17 articles. Ultimately, 6 articles were included in the present study (Table 1).

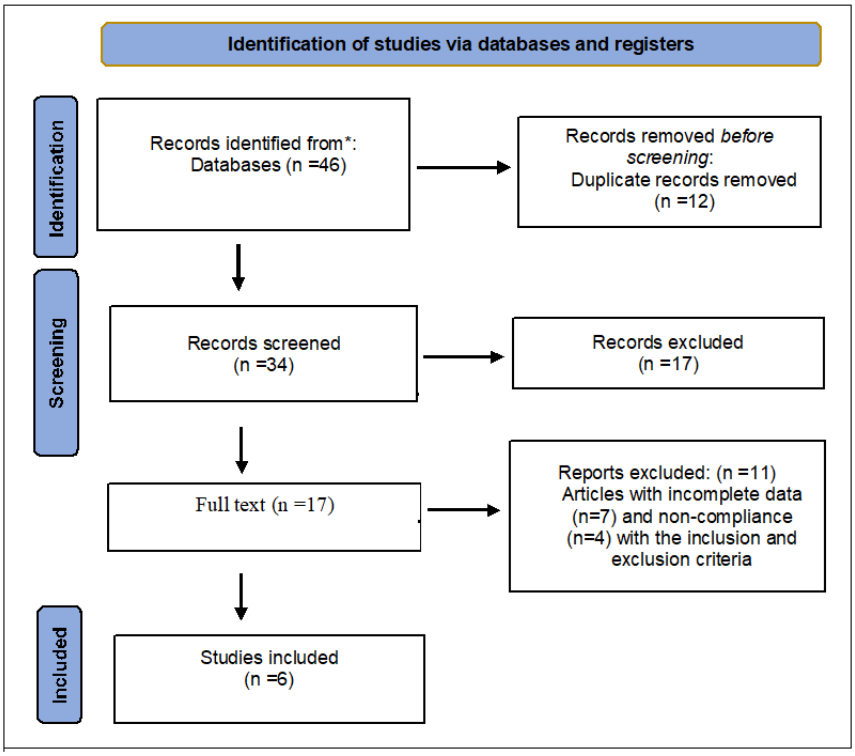


Figure 1. Flow PRISMA 2020 of included subjects.

Table 1. Included subject.

Raw	***Study***	***Year***	***Proportion Wight 98%***		***Weight*** %
1	Barros & Enfield	**2023**	0.68	**[0.52 – 1.06]**	6.02
2	Mitropoulou & Fitzsimmons	**2022**	0.74	**[0.31 – 1.08]**	5.92
3	Nolan et al	**2024**	0.89	**[0.19 – 1.01]**	5.65
Heterogeneity t^2=0.00, I^2=0.00, H^2=1.00			0.98	**[0.20 – 1.06]**	
Test of Θ= Θ, Q (4) =4.44, P= 0.71					
1	Migdady et al.	**2020**	0.84	**[0.27 – 1.08]**	6.08
2	Morgan et al.	**2021**	0.76	**[0.36 – 1.06]**	5.82
3	Dalton et al.	**2021**	0.69	**[0.28 – 1.05]**	5.85
Heterogeneity t^2=0.01, I^2= 0.00, H^2=1.00			0.0.95	**[0.29 – 1.06]**	
Test of Θ= Θ, Q (4) =3.49, P= 0.80					

If people in the community are trained in basic *CPR*, they can perform *CPR* until emergency services arrive, greatly increasing the patient's chances of survival. When the activity of the heart muscle stops, the blood supply to different parts of the body, including the brain, stops. If 4-6 minutes have passed since cardiac arrest and no action is taken to revive the patient, there is a possibility of brain damage (Yannopoulos et al., 2020). If 10 minutes have passed since cardiac arrest and *CPR* is started after that, the brain will be lost and even if resuscitation is successful, the patient will be brain dead. So one of the most important points is to immediately start *CPR* as soon as cardiac arrest is detected. Time is of the essence. Even a one-minute delay in starting CPR reduces the likelihood of success. The signs and symptoms of cardiac arrest are very clear. Sudden loss of consciousness (unresponsive when we shake the person's shoulders and call) (Behrouzi et al., 2014), no breathing or abnormal breathing, and most importantly no pulse. To assess the patient's breathing, we must bring our face close to the victim's mouth so that we can simultaneously assess the temperature of the breath, the sound of the breath, and the movement of the chest (Chaboyer et al., 2013).

To check the presence of a pulse in adults, we must touch the carotid pulse, which is located on the neck and the first depression on both sides of the throat. This should be done in less than 10 seconds so as not to lose time for resuscitation. If there is no pulse, cardiac arrest is confirmed. If the resuscitator cannot check the presence of a pulse, he can be satisfied with the previous symptoms (lack of consciousness and breathing) (Dahmardehei et al., 2020).

After confirming the cardiac arrest, the first step is to activate the emergency system and ask for help. Then the security of the place must be ensured. We place the patient on his back on a hard surface (for example, the floor). The next step is to start chest massage immediately. Pressure should be applied vertically on the last third of the breastbone. Chest compressions should lower the patient's chest by at least 5 cm. After each chest compression, the pressure should be removed from the chest to return to the previous shape (Eriksson et al., 2018). This causes the heart to fill with blood again, and with the next push, the blood is pumped out of the heart. In some cases, when the rescuer has not been trained in mouth-to-mouth breathing, the rescuer can only give chest compressions. In this method, the resuscitator compresses the chest 100-120 times per minute. If the person is trained, he performs cycles consisting of 30 chest compressions followed by two artificial respirations until the rescue forces arrive (Fathi et al., 2016).

Regarding mouth-to-mouth breathing, we bend the patient's head back slightly, pull the patient's chin up with one hand, and close the patient's nostrils with the other hand. We take a deep breath and by placing our lips on the patient's lips, we breathe to the patient within one second. By raising the patient's chest, we make sure that breathing has been given successfully. We immediately give the second breath to the patient with the same conditions as before. There should be one second between two breaths. In general, we give the patient two breaths in less than 5 seconds and immediately give 30 chest compressions and breathe again (Fazaeli et al., 2020).

This pattern is performed for 2 minutes or 5 cycles, and after that the condition of the person in need of resuscitation is checked again. If the cause of cardiac arrest is suffocation, artificial respiration must also be performed. But if it is due to heart problems, only chest pressures can be considered. If two resuscitators are present on the scene, they should change their places frequently. Because the fatigue of the resuscitator does not create a suitable depth for chest compressions and the quality of *CPR* decreases. One of the most important points during resuscitation is to minimize stops during resuscitation. We must continue chest compressions so that the blood supply and oxygenation to the brain does not stop (Lussier et al., 2024). Another important point is the quality and number of chest compressions. Chest compressions should be done approximately 2 times per second. In terms of depth, the chest should be compressed 5 cm in adults and 4-5 cm in children. If there are secretions inside the patient's mouth, the patient should be turned to the side to drain the secretions and prevent the secretions from entering the body lungs and prevent pulmonary infection.

If there is a smart electroshock device, this device can be used during basic *CPR*. There are two adhesive pads that need to be stuck on the chest at the marked place. After turning on the device, press the Analyzes button. If there is a need for a shock, the device informs us in an audible and visual way. The resuscitator should press the special energy discharge button to discharge the electrical energy to increase the chances of the patient's cardiac activity returning and continue chest compressions and breathing again for 2 minutes.

3.1. Massage and Cardiac Resuscitation of Babies

Cardiac arrest in babies under one year usually happens due to lack of oxygen. If you are sure that the baby is choking, perform first aid for suffocation, but if you do not know why the baby is not breathing, perform CPR.

3.2. Cardiac Resuscitation of Pregnant Women

If you are performing CPR on pregnant women, move them to the left. Make sure someone calls 115 so paramedics can take him to the emergency room. While you wait for them to arrive, apply chest compressions or cardiac massage by positioning yourself on top of the patient and aligning the sternum with the spine (Gheshlaghi et al., 2023).

3.3. The Difference Between Resuscitation in Children and Adults

Cardiac resuscitation cycle is slightly different in adults and children. When performing *CPR* on an adult, the rescuer should place his hands in the center of the chest and push down at a rate of 100 to 120 compressions per minute to a depth of 5 cm. For a child, the rescuer should use one hand to perform chest compressions to a depth of 3 cm.

3.4. Cardiac Resuscitation in Drowning

Performing advanced cardiopulmonary resuscitation 2022 and newer with rescue breaths on the drowning person is essential to maintain blood flow and oxygenation to the brain. In this situation, without cardiopulmonary resuscitation, the flow of oxygen to the brain slows down or stops, and eventually respiratory and cardiac arrest may occur (Imani and Noroozi Seyed Hosseini, 2023).

3.5. Heart Attack Prevention Drugs

Medicines that are prescribed to prevent heart attacks serve 2 purposes. At first, their consumption is suggested to healthy people who are healthy, but there is a risk of heart problems in them. The second group is people who have suffered from heart diseases and now the use of these drugs will be prescribed to prevent the return of the disease.

3.6. ACE Inhibitors

These drugs help to open blood vessels. If you have high blood pressure, you will be prescribed these drugs. One of the common side effects of this type of medicine is dry cough. Other side effects are rare (Faridaalaee & Irajian, 2016).

4. DISCUSSION

Cardiopulmonary arrest is a common cause of death and can occur unexpectedly at any time or place (Dalton et al., 2021). This factor is one of the most important medical emergencies that occur in various situations from unexpected accidents outside the hospital to predictable situations inside the hospital. Cardiopulmonary resuscitation as a general skill (Lee et al., 2021) is one of the greatest inventions in the history of medicine and intervention. It is quick and urgent in preventing

death or postponing it in a person who has suddenly suffered cardiopulmonary arrest (Cahn, 2022). Cardiopulmonary resuscitation includes organized actions that are performed in patients with cardiopulmonary arrest (Min Ko et al., 2016). It is an effort to keep the circulatory and respiratory systems active to the extent that enough oxygen is provided to keep the body's vital organs alive until the physiological activity of the circulatory system returns to normal. Cardiopulmonary arrest is the cause of half of deaths. In general, 50% of deaths occur suddenly (Mahmut, 2022), and only 25% of these undergo cardiopulmonary resuscitation (Margy, 2022).

Today, cardiopulmonary resuscitation is performed in two forms: Basic life support (*BLS*) and advanced life support (*ALS*) (Gyllenborg et al., 2017). Basic *CPR* can be performed without any additional equipment and with bare hands. Performing this method correctly and on time can save many lives from certain death. In the case of advanced CPR, more specialized measures such as airway care and drug therapy are performed during *CPR*. Cardiac arrest has various causes (Javedani Masroor et al., 2022) including heart diseases, respiratory diseases, airway obstruction, drug poisoning, electrocution, drowning, severe frostbite. Unfortunately, many cardiac arrests happen outside the hospital, and in most cases, the patient dies before the emergency services arrive.

The goal of cardiopulmonary resuscitation is to reduce mortality (Bingham et al., 2020). Cardio-pulmonary arrest is very difficult to study and investigate even in advanced centers, because most deaths happen unpredictably and rarely happen in the presence of first aid.

Delay in the initiation of resuscitation is effective in the final outcome, and performing resuscitation only with cardiac massage without breathing also increases the chance of survival (Andersen et al., 2019). The fact is that at the beginning of the cardiac arrest, there is enough oxygen to continue the resuscitation with only chest massage, but as the resuscitation continues, the need for oxygen also increases. Therefore, trained rescuers are advised to perform *CPR* completely and following the sequence of cardiac massage and breathing. However, if rescuers are unwilling or unable to perform respirations, chest compressions alone are better than stopping *CPR*. The patient should be regularly monitored for breathing (Bateman et al., 2016). The return of the patient's breathing normally, as well as the return of the patient's consciousness in the form of standing up or moving or starting to speak consciously, is a sign of the end of resuscitation at this stage and the return of spontaneous blood circulation. Pulse checking is not mandatory in regular resuscitation evaluation, especially for the lay rescuer, and the opportunity to do it should

not be wasted. Health care providers are allowed to check the patient's central pulse every 2 minutes and can spend up to 10 seconds each time checking the pulse (Bao et al., 2014).

5. CONCLUSION

Although nearly fifty years have passed since the start of cardiopulmonary resuscitation, the survival rate of people is still poor. One of the important and influential factors in a successful resuscitation is to open the airway and intubate the patient in less than 5 minutes. *BLS* procedures were not performed for patients dispatched by EMS, and insufficient coverage of emergency as well as the late or inappropriate transfer of patients by emergency are the reasons for the low success rate of resuscitation. The location of cardiopulmonary arrest was one of the factors affecting the outcome of resuscitation. It seems that the availability of more preparations and the permanent presence of anesthesia technicians to perform resuscitation and establish an airway in this section are important factors for the success of resuscitation. Considering that the highest rate of cardio-respiratory arrests in the present study was in the wards, it is suggested that the respected officials provide the existing conditions in the wards and increase the success rate of resuscitation. Based on results, if *CPR* is performed only in the form of cardiac massage by an observer, the survival rate is clearly higher than when *CPR* is not performed, and it has the same effect as full CPR in the first minutes.

6. CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

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