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The Principles of Medical care in the Emergency Medicine Unit Based on Clinical Points and Cardiopulmonary Resuscitation

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Abstract

The present study investigated the principles of medical care in the emergency medicine unit, relying on clinical points and cardiopulmonary resuscitation. Resuscitation operation maintains the blood flow to the important organs of the body (including the brain). In the current study, the issue was investigated by reviewing more than 80 articles and considering key words such as: "Medical care", "Emergency Medicine Unit", "Clinical Points and Cardiopulmonary Resuscitation". 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, bringing of an AED shock device, rapid transport by EMS to the emergency room, continuing advanced resuscitation in the hospital. 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 to react or breathe or are not breathing normally. The number of successful cases of cardiopulmonary resuscitation is one of the important indicators of hospital emergencies. So that this amount is high, it is a sign of emergency success. Many cases of cardiopulmonary arrest can be reversed by performing rapid and correct cardiopulmonary resuscitation. On the other hand, even though nearly forty years have passed since the beginning of this process, the survival rate of people is not ideal and the death rate after cardio-pulmonary arrest is still high compared to other cases. In developed countries, the survival rate of cardiac arrest that occurs in the hospital and outside it 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 in-hospital cardiac arrests and 0.2 to 10% in out-of-hospital cardiac arrests have been reported.

Key words: Medical Care, Emergency Medicine Unit, Clinical Points, Cardiopulmonary Resuscitation, Massage.

Introduction

The increasing growth of medical knowledge along with multiple theories and approaches of teaching and learning has created new responsibilities for managers [1-3], lecturers and students in the higher education system, one of the main axes of which is choosing the most appropriate teaching and learning method [4]. In traditional education methods, the learner is not given the opportunity to think, which is essential in learning. In traditional teaching methods [5], including lectures, teachers do not make sure that the learner has understood the material; They continue to teach and there may be a series of unknowns left for him [6]. The traditional education process does not meet the needs of the present age [7]; Therefore, this teaching method has been reviewed for years. Many researchers believe that if its disadvantages are removed, this method can lead to deep and active learning along with other modern methods [8]. Today, on the one hand, the use of the Internet has increased in the world. According to global statistics [9], out of the 82 million population of Iran in 2019, more than 62 million people are internet users. On the other hand, students belong to the two generations of technology and the Internet, who like different educational methods compared to the previous generations. The third millennial generation or (Y) born from 1980 to 2000 AD and the Internet generation or (Z) born from 2000 AD onwards are less interested in education through traditional methods. Therefore, for their education, it is necessary to change the traditional teaching methods to methods that can create interest and motivation in these students [10-12]. Presentation and teaching of courses in universities is often done by the presence of professors and students in the classroom. This method does not pay special attention to the student's learning speed [13]. Usually, there are people in the class who learn the material quickly, but some students need more time to review their learning, and both groups suffer in the traditional system [14].

This method is mostly based on memorizing course material and less attention is paid to actual learning. With the spread of information technology and the penetration of remote mass communication tools into the depth of society [15], the tools and methods of education are also changing, so that with the advancement of technology,

the use of newer tools to transfer knowledge has been proposed, and with the increasing growth of information technology and communication, traditional methods of education do not respond to the educational needs of societies [16]. With regard to the expansion of access possibilities and greater use of the global network as a powerful medium for exchanging and transmitting information and the increasing interest and popularity of medical students in using this medium as a source of information and despite the favorable results of distance education in advanced countries [17], especially in the field of reproducibility of the process of recruiting users in the virtual space of education, depending on their choice and needs, have turned this form of education into one of the important bases in medical education [18]. Advanced cardiopulmonary resuscitation (ACLS) is a set of measures that are used in order to resuscitate the heart and lungs of patients [19]. The importance and necessity of teaching this topic to medical students as the person responsible for the patient's life is clear and obvious. On the other hand, it is clear that holding a face-to-face workshop can be very costly and time-consuming to visit the planned centers for training [20].

Search strategy and selection of articles

Search in Scopus, Google scholar, PubMed databases and by searching with keywords such as "Nursing Services", "Medical care", "Emergency Medicine Unit", "Clinical Points and Cardiopulmonary Resuscitation" to obtain articles related to the selected keywords [21]. Case report articles, editorials, and articles that were not published or only an introduction of them were available, as well as summaries of congresses and meetings that were in languages other than English, were ignored (figure 1) [22].

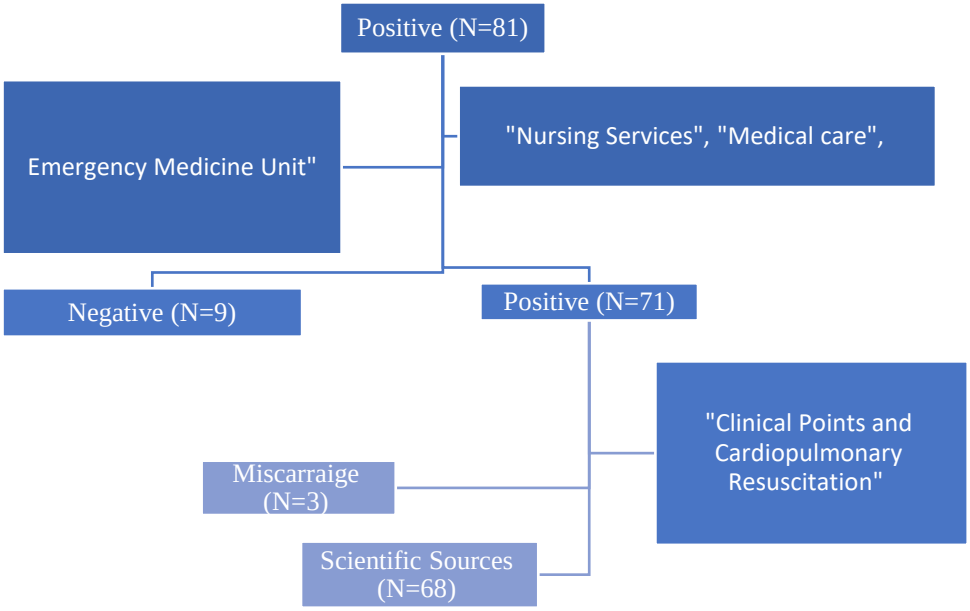

Figure 1. Flow chart of included subjects

Literature Review

In the study conducted by Makransky et al., in the field of virtual simulation of the educational environment in medical genetic counseling, the students' knowledge, attitude and self-efficacy score increased significantly compared to the pre-test, which is in line with the present study, the OSCE score of the students under virtual training and non-attendance shows a significant increase compared to the pre-test [23].

In Sabouri et al.'s study regarding the effect of face-to-face and virtual training methods on pharmacy students' scores, the average final exam score of students under virtual training with the Navid system was significantly higher than the students of the face-to-face training group with lectures. Also, no significant difference was observed between the scores of male and female students. Most of the students wanted to use the virtual education method in the pharmacy internship course, which is in line with the present study. So, that the average theory score of interns under virtual training was significantly higher than the face-to-face training method, and

no significant difference was observed between male and female students in terms of theory and ASK scores in both face-to-face and non-face-to-face groups [24].

The results of Farahmand et al.'s study on two groups of 60 medical intern students of Tehran University showed that non-face-to-face training is more effective than traditional face-to-face training. In the present study, virtual education was more effective than face-to-face education in theoretical knowledge, which is consistent with Farahmand's results. In the research conducted by Shorcheh et al. in Hamedan in 2019, titled comparing the effect of face-to-face and teacher-centered teaching methods with virtual education on the learning rate of students in the history of Islamic culture and civilization course, the average test scores in the face-to-face method were higher than the virtual method [25].

The results of Hashemiparast et al.'s study in 2016 under the title of comparing the effect of two methods of electronic education and lectures on the level of knowledge of administrative staff of clinical departments of selected hospitals of Tehran University of Medical Sciences in the field of hospital infection control showed that after the intervention, the average knowledge score of learners in lecture group is more than the electronic method, which is not compatible with the present study [26].

In the semi-experimental study conducted by Zeraati et al., comparing the effect of two lecture and network-based teaching methods on the improvement of students' academic performance; Mazandaran University of Medical Sciences, in the undergraduate and associate degrees and the courses of principles of epidemiology, epidemiology of common diseases, maternal and child health, and reproductive health, the results of the study showed that the average scores of students in the face-to-face and virtual tests are not significantly different. If in the present study, the teaching of theoretical topics, due to the nature of the courses presented in a virtual and non-attendance format, had a greater effect than face-to-face education in the transfer of scientific concepts [27]. The results of Hosseini Kasnoye et al.'s study comparing face-to-face and non-face-to-face training programs in improving the skills of how to convey bad news by emergency medicine assistants showed that there is no significant difference between the average score of attitude in the study groups after the intervention compared to before. In the comparison of the performance score after the training compared to before, a significant difference was observed in both training methods. These results are contrary to the findings of the present study, but they are consistent in terms of practical ability [28].

The results of Rastegar Farajzadeh's study under the title of comparing the effectiveness of face-to-face and virtual training of basic cognitive skills in mental rehabilitation day care centers during the Covid-19 pandemic showed that face-to-face training compared to virtual training and the combination of the two improved the cognitive abilities of educators and related families. It is more effective with the basic skills of children; the results of this study are in line with the findings of the present study. So that it was more effective in increasing the capability of theoretical knowledge and the same in the field of practical knowledge [29].

Today, cardiopulmonary resuscitation is performed in two forms: Basic life support (BLS) and advanced life support (ALS). 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. including heart diseases, respiratory diseases, airway obstruction, drug poisoning, 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 [30].

Analysis of the subject

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 [31]. 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) [32], 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 [33].

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) [34].

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 [35]. 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 [36].

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 [37].

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 [38]. 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 [39].

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 [40].

Massage and cardiac resuscitation for children

Cardiopulmonary and respiratory resuscitation for children one year and older is similar to adults:

- First, place the child on his back, on a hard and flat surface.
- Kneel next to the child's neck and shoulders [41].
- If the child is very small, just place one hand in the middle of the chest. But if it is almost big, you should use both hands.
- Using the heel of one or both hands, push the child's chest down 4-5 cm. The pressure should be strong and fast, meaning 100 to 120 massages per minute [42].
- If you are not trained in CPR, continue CPR until emergency medical personnel arrive. But if you are trained, open the airway and start artificial respiration. You should freely give the child two artificial respirations every 30 chest massages.

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:

- First you need to check the situation. Touch the baby and wait for movement response. If no response is received, call emergency and start CPR immediately [43].
- Place the baby on its back on a flat and firm surface such as a table or floor.

- Imagine a horizontal line drawn between the baby's nipples. Place two fingers of one hand just below this line, in the center of the chest.
- Gently compress the chest about 4 cm [44].
- You should do 100 to 120 massages in one minute like adults.
- After every 30 pressures, slowly turn the baby's head back and lift the chin with one hand and press the forehead down with the other hand.
- Cover the child's mouth and nose with your mouth [45].
- You should give two artificial respirations to the baby, but be careful to slowly enter the air into the baby's lungs by breathing slowly into the baby's mouth once and taking a second for him to breathe. Pay attention to whether the child's chest rises or not. If so, give a second CPR. If the chest does not rise, repeat the airway opening maneuver, then give a second breath [46].
- If the baby's chest does not rise, continue chest compressions.
- You should continue cardiopulmonary resuscitation until you see signs of life or until medical personnel arrive.

Cardiac resuscitation of pregnant women

If you are performing CPR, CPR, or 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. If you are performing CPR, CPR, or CPR on pregnant women, move them to the left [47].

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 [48].

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 [49].

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 [50].

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 [51].

Beta blockers

These drugs are prescribed to lower blood pressure and heart rate. One of their common side effects is coldness of the hands [52].

Antiplatelet drugs. This type of medicine will prevent clots in the arteries. These drugs may be prescribed together with aspirin. Taking these drugs can increase the risk of bleeding [53].

Aspirin

This medicine prevents blood clotting. Its common side effects include stomach upset and nausea.

Statins

If the level of LDL in the blood test is high, these types of drugs will be prescribed to reduce it and prevent a heart attack. Muscle pain is one of the common side effects of taking these drugs [54].

Diuretic drugs

These types of drugs reduce sodium levels in the blood. In this way, the increase in blood pressure is prevented. This in turn will reduce the risk of heart attack. Their side effects include thirst and increased urination [55].

Anticoagulants

These types of drugs reduce blood clotting. Their consumption can lead to severe bleeding. One of their side effects in women is severe menstrual cycles [56].

Discuss

Cardiopulmonary arrest is a common cause of death and can occur unexpectedly at any time or place [57-59]. 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 [60-62], 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 [63]. Cardiopulmonary resuscitation includes organized actions that are performed in patients with cardiopulmonary arrest [64-68]. And 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 69-71]. Cardiopulmonary arrest is the cause of half of deaths. In general, 50% of deaths occur suddenly [72-74], and only 25% of these 50% of patients undergo cardiopulmonary resuscitation [75-77]. The goal of cardiopulmonary resuscitation is to reduce mortality in this 25% [78-80]. 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 (Table 1).

Table 2. Forest plot showed the Principles of Medical care in the Emergency Medicine Unit Based on Clinical Points and Cardiopulmonary Resuscitation

Raw	Study	Year	Proportion Wight 98%		Weight %
1	Zhang et al.	**2023**	0.68	**[0.52 – 1.06]**	6.02
2	Yasrebinia et al.	**2024**	0.74	**[0.31 – 1.08]**	5.92
3	Taban et al	**2023**	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	Sharifi et al.	**2024**	0.92	**[0.39 – 1.06]**	5.03
2	Rostami et al.	**2020**	0.87	**[0.54 – 1.02]**	6.02
3	Otaghvar et al.	**2024**	0.88	**[0.63 – 1.01]**	5.57
Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.00			0.95	**[0.22 – 1.07]**	
Test of Θ= Θ, Q (4) =5.55, P= 0.74					
1	Naghdipour et al.	**2022**	0.84	**[0.27 – 1.08]**	6.08
2	Milanifard et al.	**2021**	0.76	**[0.36 – 1.06]**	5.82
3	Irajian et al.	**2016**	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					

Conclusion

Although nearly fifty years have passed since the start of cardiopulmonary resuscitation, the survival rate of people is still poor. Past researches have shown that various factors are effective on rehabilitation operations. 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, according to the hospital staff, "The technicians of 115 do not intubate the patient and only act as carriers in the transfer. Patients go to the hospital, which is due to the lack of sufficient training." In the studied centers, BLS procedures were not performed for patients dispatched by EMS; Another study that was conducted inside the country listed the insufficient coverage of emergency 115 as well as the late or inappropriate transfer of patients by emergency as 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. Studies have shown that the survival rate if CPR is performed only in the form of cardiac massage by an observer is clearly higher than when CPR is not performed, and it has the same effect as complete CPR in the first minutes. Some observers do not perform CPR due to the discomfort of mouth-to-mouth breathing and the stress of transmitting diseases. Any 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. Therefore, it is recommended. 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 victim should be regularly monitored for breathing. 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.

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