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Original Research

Comparing Different Training Methods in Cardiopulmonary Resuscitation CPR: A Narrative Review

Fatimah Ali Abdulzahra[1] | **Adraa Hussein Shawq**[2]

[1]Babel teaching hospital for maternity and pediatric, Ministry of Health, Babel Health Directorate, Iraq.
Email Id: fatima.ali2204m@conursing.uobaghdad.edu.iq

[2]Assistant Pro.Dr. Department of Pediatric Nursing, College of Nursing, University of Baghdad
Email Id: draa.hussein@conursing.uobaghdad.edu.iq

Abstract

Background: Cardiac arrest is one of the major health issues around the world. It's important to train professional and non-professional individuals in cardiopulmonary resuscitation (CPR). Traditional methods of teaching CPR are not effective, as skill retention does not last for a long time, which may translate to a poor outcome with CPR. A variety of ways have been adopted to provide optimal, effective, and attractive CPR teaching.

Objectives: study aims to review studies that compare the effectiveness of different CPR training methods.

Methods: The authors carried out searches on the available databases, such as Google Scholar, Research Gate, Semantic Scholar, Elsiver, and PubMed, and included studies published between the periods 2018 and 2023. The targeted sample of the chosen study was staff of different health fields and students from any category of health-related colleges and institutions. the study should also include a comparison between two or more CPR training methods, 30 studies were included after screening 600 studies, and the data was extracted, categorized, and summarized depending on the PICO model. (P) For population, (I) for Intervention, (C) for Comparison, (O) for Outcome

Results: Thirty studies met the inclusion criteria; all studies included comparisons of two or three CPR training methods that tested the effect of such methods on CPR quality, skills, knowledge, performance, and awareness.

Conclusion: This review highlights the fact that adopting new methods in teaching CPR is more effective than the old traditional approaches in terms of knowledge, skills, and performance. This review outlines a step for further research on adopting a standardized CPR training method.

Keywords: cardiopulmonary resuscitation; training or teaching methodologies; basic and/or advanced life support for ALS.

Introduction:

Cardiac arrest is a worldwide crisis that affects 1000 people per day, according to the latest statistic from the American Heart Association.(1) The database of national cardiac arrests revealed that cardiac arrest rate is still associated with mortality of 9–10 per 1000 admissions in hospitals, which has been improved over time with rapid responses` from medical teams, Despite the standardization of practice, the survival rate still varies among countries.[2] Cardiovascular diseases account for most deaths related to cardiac disorders.[3] Cardiac arrest related to cardiac disease ranked worldwide as the first cause of death and has been a global crisis.[4] According to the World Health Organization (WHO), there were about 7.4 million deaths due to heart disease in 2012, with high-income countries and upper-middle-income countries accounting for 158 and 107 deaths per million, respectively .[5] It it expected to continue to be the top futuristic cause of death in the world wildly. [1]

Cardiopulmonary resuscitation CPR procedures need to be started immediately as time is considered a critical component, To maintain blood flow to the vital organs in the entire process and survive with good outcomes, due to the critical role of resuscitation in saving lives, healthcare professionals should have adequate knowledge, skill, and competency to perform them. This should be overemphasized as healthcare professionals face emergencies on a daily basis.[6]

Given the above, it is crucial to provide effective CPR training with high quality to gain the expected outcomes, Resuscitation outcomes dramatically enhanced with the presence of more skilled care providers; the number of successful resuscitation cases increased from 4% to 30% when well-trained staff handled them, Various ways of training had been developed to enhance the knowledge and skill retention of trainers, Noticeable knowledge gap was spotted because non-compulsory training courses were scheduled and there were no strict rules for revalidating certification or license in the training of health professionals.[7] However, decaying of theoretical and practical knowledge occurs over time, as there is no known exact time when the decline of retained knowledge appears, although health professionals who train frequently show better performance, It is still unknown how long the ideal training intervals should be.[8] The new technologies have been recently engaged in resuscitation training and education courses and programs; they have shown a vital role in breaking the wall of limitations, using virtual reality and augmented reality as examples. [9]

Despite the emergence of many new technologies used for training, each of these methods still encapsulates various advantages and disadvantages. Some technologies participated in and positively affected the overall outcome of health care and clinical work.[10]

International guidelines of resuscitation recommend incorporation of new technologies into resuscitation training replacing the traditional methods of training, which became highly prominent during the pandemic of COVID-19 where technology-based CPR training used alternatively, Examples of such methods are web-based training, advanced manikins, mobile applications, and computer programs, the future potentials of proliferation of such training are tremendously hopeful as current studies demonstrated good skill and knowledge retention with using technologies, the non-inferiority of technology-based training open the door for adopting it as alternative for old training ways.[11] The widespread use of smartphones promotes different aspects of the benefits of investing in them for education and training purposes, for example, the smartphone app.[12]

In 2020, with the emergent COVID-19, it morphed into a pandemic and unforeseen situation that created a heavy and unexpected burden on the health system.[13] Both hospitalized patients and healthcare staff were at risk of infection, and the nurse practice was affected by the restricted precaution protocols.[14] resulting in a significantly high prevalence of anxiety and depression among healthcare professionals affecting their performance and reducing the chance of training opportunities .[15, 16]

As health staff responsible for patient care, they should be armed with a wide array of skills and knowledge in critical situations.[17] this study aims

to review studies that compare different CPR training and teaching methods among healthcare professionals and medical fields students in health-related colleges, as these categories are faced and going to face the critical situations of such life-saving procedures and they should choose the way they find suitable for CPR training Learning as CPR is essential for medical staff and students because it equips them with the necessary skills to respond effectively in situations of emergencies. Having the ability to perform CPR can help save lives by initiating immediate care for individuals having cardiac arrest until advanced medical help arrives. In the healthcare field, knowing how to administer resuscitation can contribute in making significant difference in patient outcomes and lives. In addition, mastering CPR techniques can boost confidence and readiness of the health professionals to handle critical medical emergencies, making it an invaluable skill for healthcare professionals and students alike.

Methodology:

A narrative review study was conducted between November 10th and December 10th, 2023, to compare different methods of cardiopulmonary resuscitation CPR training and education. With the emergence of many new modalities combined with high technology, the question of whether or not the traditional ways will be replaced with modern approaches and whether the latter is as effective as the traditional CPR training. The research was initiated by categorizing the studies according to the PICO model. (P) For population: staff and students in health-related fields,(I) for Intervention: CPR training methodologies, (C) for Comparison: Two or more CPR training methodologies, (O) for Outcome: CPR knowledge, and skill quality performance). After identifying the research domain, inclusion and exclusion criteria were established to select related articles. After the quality assessment of the articles included, extraction, organization, and summarization of data done and charted accordingly. The results of the study were analyzed and reported. The previously mentioned research question guided this review

SeZrch Methodology

Strategies of searching started with looking for studies that were published between 2018 and 2023 on the available databases, such as Google Scholar, Research Gate, Semantic Scholar, Elsiver, and PubMed. The researcher used the studies published within such a limited period trying to stay updated with the latest advancements, findings, and methodologies in the area of researches. It provides the most recent findings and insights, ensuring that the study stays relevant, accurate, and evidence-based, maximizing its credibility and significancy. In addition, it promotes continuous learning , encouraging to evolve our understanding as scientific knowledge advances. Therefore, referencing newly published studies is vital in producing high-quality research that is in tune with the current scientific landscape.

Research design

The keywords used for searching include “cardiopulmonary resuscitation” or CPR, training or teaching methodologies, "basic life support” or BLS, “advance life support” or ALS, medical students or/and (nursing, dental, health science), and health care professionals or (doctors, nurses, paramedics).

Inclusion and exclusion

The review included studies published between 2018 and 2023. The studies included comparisons between two or more CPR training methods; all candidate studies targeted healthcare professionals and students under any title belonging to the medical fields. Any study involving a single method used pre- and post-tests is excluded, moreover some studied excluded for language barriers.

Screening articles

Studies went through two steps of screening by the researchers: the first step was a quick review of both the title and abstract to decide whether or not the study met the inclusion criteria established; the second step included further screening of the entire article for the final decision.

Data extraction

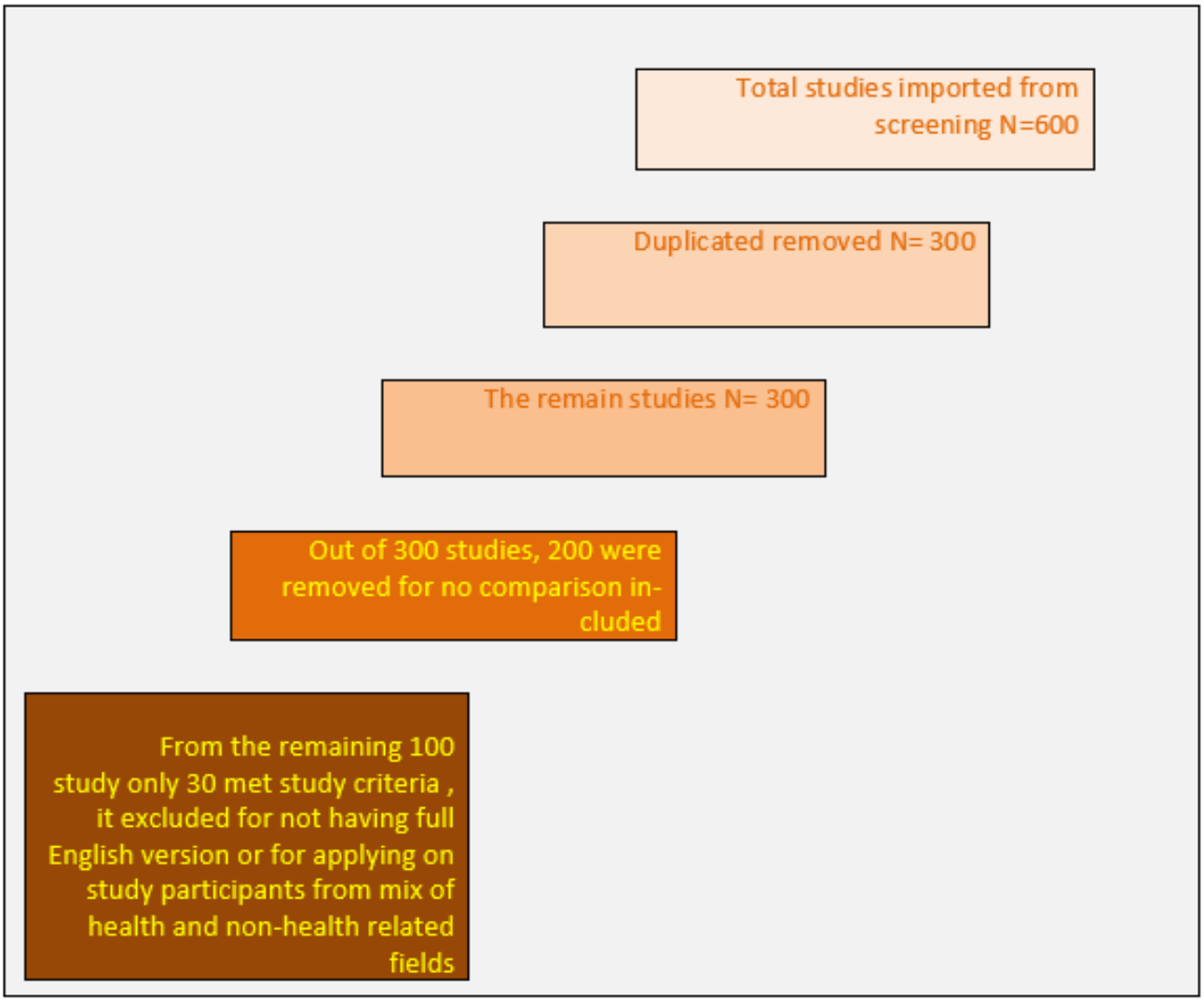
After the selection of articles, data is extracted and recorded by forming a data extraction form in a Microsoft Excel spreadsheet. The domains included in

the data extraction form were the previously mentioned model

Result:

A total of 600 studies were retrieved from the targeted websites. About 300 studies were excluded, and 300 of the remaining some were duplicated. Out of 100 studies, 30 were chosen, and the others were removed either for not comparing different methodologies, for language barriers as there was no English version of the research, or for including a mix of medical and nonmedical work fields. Fig(1)

Figure (1) the process of searching and selecting the research articles

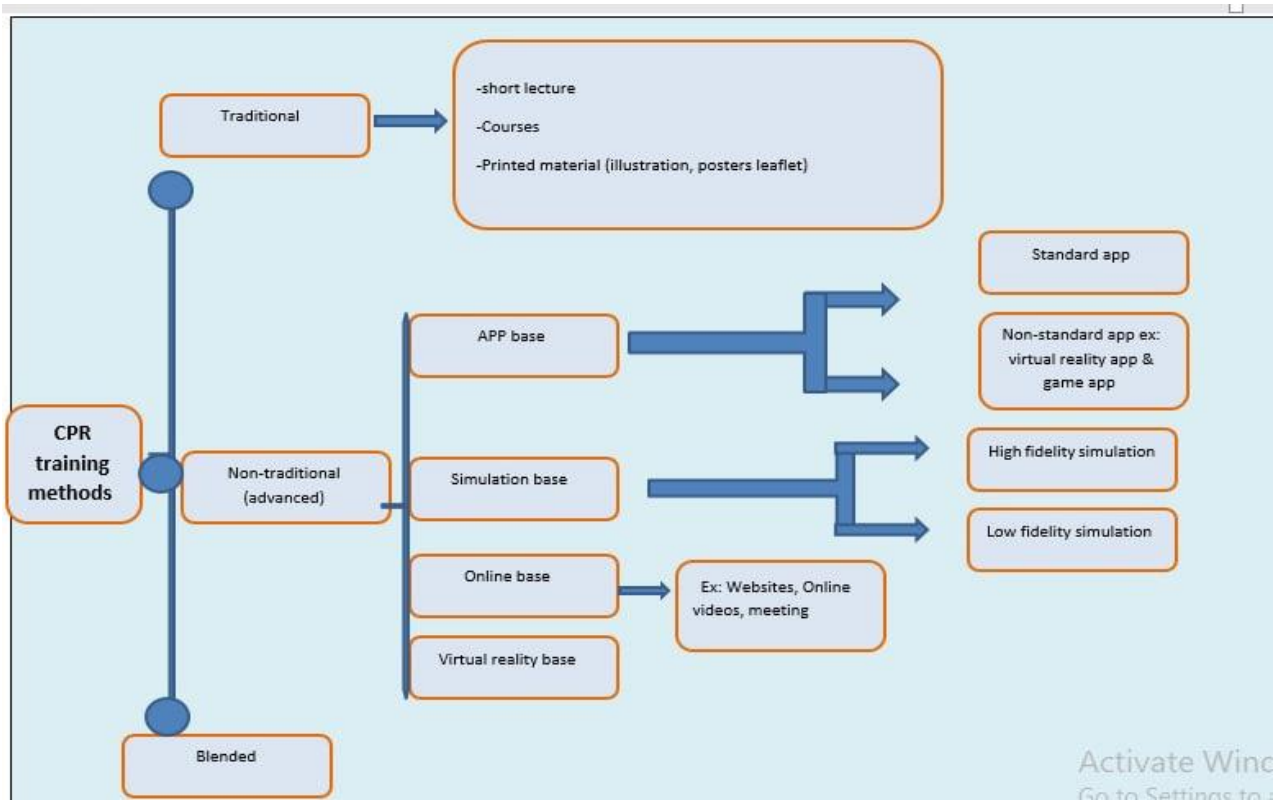


Different CPR training methods

From the review of 30 studies, a conclusion could be derived as there are three main CPR training modalities the traditional non-technology-based method that is commonly used for a long time and may introduced as a one or three or six month courses that commonly contains face to face lecturing over a long period commonly comes with certificate. Another traditional way is a short lecture that comes as a day's program and the last classical way is printed-paper material like posters.

On the other hand, with the emergence of new technologies; much technology-based training occurred in different forms and content like apps, simulations, online, and virtual reality. Some studies included multimedia methods to produce blended learning for better outcomes. Figure 2.

Figure 2. Outcomes of comparison between different training and teaching methods in cardiopulmonary resuscitation



CPR Traditional and Technology-Based Training Methods

From 30 studies about 17 were involved in comparing two or three of traditional and non-traditional methods. In a pilot study that compared the effect of online versus face-to-face CPR training methods on the quality of chest compression among medical students, the result reported a minimum enhancement in chest compression quality in online training groups which suggested adopting online as an alternative training method.18 the online CPR training is as effective as a traditional face-to-face method, this concluded by a Russian study conducted on nursing students.[19]

These findings come in line with an Iranian study conducted on nurses when comparing the traditional with the E-learning methods in CPR teaching, the study found both methods had contributed to improving nurses` knowledge, skill, and satisfaction.[20]

Comparing traditional lecture with the online video method in a previous study, that used two groups of paramedics, the result showed the score of the video group was higher than the lecture group regarding their knowledge and performance.[21]

The simulation was compared to traditional training in China in a study, that applied to nurses to examine their CPR performance, the study reported performance enhancement in the simulation group with less time elapsing between call for help and initiating chest compression.[22]

However, some studies showed no differences between the methods of training. In a Spanish study that compared traditional training with the virtual reality method, when conducted among 241 students at a health sciences college, the study found no static difference in CPR skills among both groups and both show the same level of skill decaying in posttest after 6 months of training .[23]

CPR Application (app) and Other Non-Traditional Methods

Nine studies included in this review used apps in different forms and content like game apps and virtual reality design. These studies compared the effects of training for an app with other training approaches like traditional, simulation, and online methods of teaching.

In a previous study conducted on nursing students in India, Simulation contributed in increasing scores in both knowledge and practice compared to app.[24] In the same approach, nurses' skills significantly increased when nurses trained with apps compared to simulation as reported by an Iranian study.[25] Similar Iranian study reported that both app and simulation contributed to improving nursing student skills, but knowledge level did not reach the expected level either with simulation or with app.[26]

When app training was compared with the online method regarding CPR applied to medical students, despite the high preference shown by the participants for the app method, the app did not gain the superiority in improving theoretical and practical CPR skills as much as online training did.[27] While app proved to be an effective tool in improving nurses` knowledge when compared with using leaflets as a tool for improving CPR knowledge, this study applied to 40 Indonesian nurses.[28]

Some studies tested the effectiveness of applying the app and compared it to traditional face-to-face and lecturing methods. Students` performance had improved significantly when they trained with app, this concluded in a Turkish study when comparing the app with the traditional training method.[29] In terms of knowledge, apps appear to be an effective tool for increasing nurses` knowledge in comparison to traditional training.[26]

CPR Alternative Training Methods (Simulation, Virtual Reality, and Online)

To assess the effectiveness of virtual reality and online training methods, a study was carried out among first-year medical students, the study found that virtual reality had highly improved CPR quality among the participants who trained by it compared to online one, the researchers revealed that virtual reality is a promising approach for bright CPR training in future.[30] Acquisition of CPR skills depends on the way of introducing CPR to the trainers, in a group of medical student participants virtual reality was found to play an important role in enhancing student skills compared to video training, these findings were proved by a German study [31]

Simulation has been widely used as a training method and positively effects on CPR knowledge, skill, and performance. The high-fidelity simulation is more effective than low-fidelity simulation as shown in a study conducted in the USA among medical students, and concluded the fact that student performance highly improved when they trained with high-fidelity simulation compared to low-fidelity simulation.[32]

Discussion:

The current review is a research papers that compare different CPR training and teaching methods, and how their effect on various outcome measures like CPR skill, knowledge, performance, quality, and awareness. The methods included both traditional and nontraditional modalities that encounter different ways of introducing CPR, each and all of these methods different in setting, time required, number of participants, mode of delivery, tools, and materials used.

Both traditional and nontraditional methods have their advantages and disadvantages and each method has its suitable and proper environment, which makes it the right choice when it is difficult to apply other types of training.

Thirty studies out of 700 studies met the inclusion criteria and were reviewed. The data was extracted and accordingly charted all studies targeted sample were health care professionals and /or students from the medical fields collages, studies published between 2018-2023, most of the included studies applied to nursing and medical students while few applied to clinical nurses and doctors.

The overall look of the study results indicates that adopting a new way of teaching CPR is not inferior in its effectiveness to the traditional methods. Interestingly the study shows the superiority of nontraditional upon tradition in some studies. Online training methods improved knowledge and performance comparing to face to face, with similar findings with app-based methods, on the other hand, some studies reported no statistical difference in both methods.

In recent years, huge attention drawn toward adopting technologies in learning, it has been recognized as the mainstream in health education including

medical, nursing, dental, and other health-related professions, the use of technology base tanning and teaching methods and its effect on knowledge, skill, and performance been well debated and argued whether or not the traditional methods will no longer used as plenty of evidence proved its effectiveness, on the other hand, few raised the doubts about whether these method trustworthy to take the position of traditional training methods.[33]

As communities change, develop, and open to each other, it's become important to keep up to satisfy the needs, as learners tend to prefer more interactive, accessible, feasible, and technology base methods, for example using virtual reality in medical training gives trainee venues to deal with a virtual patient, practicing diagnosis, and perform the high-risk medical procedure without the fear of harming or being harmed.[34]

Traditional teaching commonly involves passive learning where the learner has to memorize and recall information, but under critical situations, many internal and external factors like fear, and stress may cause incorrect management of the situation.[35] Many rapid changes of circumstances around the world caused many educational institutions to adopt new technologies for education to respond to the development.[36] With the emergence of COVID many questions were raised about whether or not care professionals are equipped with proper training and knowledge this led to a rethink for new alternative training.[37] many institutions confronted various difficulties and challenges in following the protection protocols including the medical education school and hospitals.[38] High spread virus but the entire community under risk epically Healthcare Professionals during the first wave 3. 8 % of infected are healthcare workers. the competent staff should adopt the concept of having both scientific and practical knowledge to make decisions and early recognition to save life.[39]The years of practice play a vital role in advancing and developing knowledge and skill among health care professionals.[40]

To sum up, with what was previously narrated, Traditional teaching has become boring and it's unappealing to trainers because of high interactivity and involvement in new technologies and media.41 It's been clear how technology proliferated, invaded, and changed all aspects of life including health, and it will continue in its innovation taking the position of many traditional methods.[42]

Implication and limitation

This study draws a step for further research for adopting standardized CPR training methods. Traditional CPR training is limited by the availability of instructors so it is considered to be limiting in scalability, especially in low-resource settings where preparing and providing the resources in a proper setting need time and money. This review paper highlights the importance of providing alternative options and recognizing the shortcomings gained from using technology-only solutions. Due to the recent worldwide pandemic of COVID-19 with the high risk of infection spreading due to contact, we believe that an alternative promising option should be applied safely and effectively replacing the traditional way of face-to-face training.

some limitations reported as Most of the reviewed studies conducted on highly developed countries with the availability of proper resources, effective adaptability successful generativity, and transformability on low resources setting cannot be fully accomplished and cannot be ascertained. All studies were conducted under a simulated environment so the result may not fully represent the actual situation where CPR is performed under highly stressful environments where patient safety are highly concerned issue. Biases toward specific methods cannot ruled out from studies. The absence of uniformity in the content and duration of different training traditional methods adopted by studies the findings cannot be concretely compared with non-traditional training.

Conclusion:

This review highlights the fact that adopting new methods in teaching CPR is effective and may be better than the old traditional approaches in terms of knowledge, skill, and performance. However quality of CPR still highly depends on in-person training. Due to the promising findings drawn from applying new methods, it becomes glaring that the need for updating is essential, particularly after the era of COVID-19. Furthermore, future research

recommended to construct uniformity in standard methods of CPR training, this could make the comparison more plausible. Future researches need also to test the effect of these methodologies in real CPR situations as the simulated environment is not fully compatible with real-time events in some aspects.

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