
NEED FOR TRAINING IN EARLY DEFIBRILLATION WITH AN AUTOMATED EXTERNAL DEFIBRILLATOR (AED) – STUDENT SURVEY

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Abstract: Cardiac arrest is a rare but life-threatening condition in which, if not responded to promptly and adequately, full recovery of vital functions is impossible, and in a high percentage of cases, individuals do not survive. It has been proven that the primary measures for survival after cardiac arrest boil down to competent and rapid application of cardiopulmonary resuscitation and automated external defibrillation. Any person worldwide can save a life if they have good theoretical and/or practical knowledge and skills to react in such a critical situation. The ability to apply automated external defibrillation quickly and in a timely manner is extremely important. The aim of this scientific report is to investigate the awareness of respondents about the need for training in early automated external defibrillation. Training programs provide information to trainees about the essence of cardiac arrest, methods of cardiac, pulmonary, and cerebral recovery, and about automated external defibrillation. A survey was conducted among 127 students majoring in Medical Assistant, Kinesiotherapy, Medical Nursing, and Midwifery in the period of April-May 2023. The questionnaire included questions about the respondents' awareness of the functions of the automated external defibrillator, their availability in public places, training in early automated external defibrillation, and symptoms of cardiac arrest. The data from the survey show that 1/4 of the respondents have no information about the functions of the automated external defibrillator; 1/3 do not have information about the location of automated defibrillators in public places; 1/3 have no information about training in early automated external defibrillation; 93% of the participants claim that mass training of the population on how to use an automated external defibrillator is necessary, and 94% report that they have the necessary knowledge to be part of a team conducting training for the proper use of the automated external defibrillator.

Conclusion: Theoretical knowledge and practical skills acquired through training on the use of automated external defibrillators will ensure early recognition of cardiac arrest and the performance of adequate life-saving measures. The application of automated external defibrillators in such conditions is crucial for survival and the minimization of severe complications in patients.

Keywords: automated external defibrillation, cardiopulmonary resuscitation, cardiac arrest

1. INTRODUCTION

The relevance of the research problem is determined by the fact that one of the primary measures applied for survival after cardiac arrest is early automated external defibrillation (AED). Every person worldwide can save a life if trained to perform early AED. Cardiac arrest most often occurs unexpectedly and can affect people of all ages, genders, physical, and health conditions. Immediate cardiopulmonary resuscitation (CPR) and early automated external defibrillation within the first 3-5 minutes of the incident can increase the chance of survival to 50-70%. To achieve this, it is necessary to popularize mass education of the population for the rapid recognition of cardiac arrest and the implementation of early defibrillation (<https://acibademcityclinic.bg>).

2. EXPOSITION

Cardiac arrest (CA) is the sudden cessation of cardiac activity due to disruptions in the heart's electrical function, resulting in arrhythmia (ventricular fibrillation or pulseless ventricular tachycardia) or asystole. The pumping function of the heart is impaired, leading to the cessation of blood supply to all organs and systems. Patients may have had prior heart conditions, but they can also be perfectly healthy. It can occur for various reasons, suddenly or in the presence of other symptoms. The symptoms of CA are sudden, severe, and include: collapse and absence of a pulse, breathing, and consciousness. Sometimes prodromes of CA are possible: chest pain or discomfort, shortness of breath, wheezing, generalized weakness, dizziness, palpitations, and more. Often there are no alarming symptoms (www.mayoclinic.org; www.heart.org; Wyatt J. et al., 2020).

In some cases, cardiac arrest is observed in other specific pathological conditions such as drug intoxication, including antiarrhythmic drugs, pulmonary thromboembolism, metabolic disorders - hypoxemia, acidosis, electrolyte disturbances - hyperkalemia, and hypokalemia (Grigorov M., Maznev I., 2015), hypothermia, drowning, anaphylaxis, trauma. In practice, the provision of fast and emergency care for rhythm disorders, as a primary symptom of the disease, is relatively rare. They occur as a result of a disturbance in the electrical impulses of the heart, which presents itself as too fast, too slow, or irregular heart rhythm and is often a consequence of certain conditions such as hypertensive crisis, stroke, myocardial infarction, acute myocarditis, etc. (Bozov H, 2021). According to the American Heart Association, early recognition of cardiac arrest, cardiopulmonary resuscitation (CPR), and early defibrillation are essential links in the out-of-hospital chain of survival (2020). The combined application of CPR with defibrillation within the first 3-5 minutes of the onset of cardiac arrest leads to survival in 49-75% of cases (Grigorov M., Maznev I., 2015). It has been proven that the application of early cardiac resuscitation and early AED even before the arrival of emergency medical assistance significantly increases the survival rate and is effective in improving survival with a good neurological outcome (Nichol G et al., 2008; Ringh M. et al., 2015; Pollack R.A., et al. 2018; Holmberg M.J. 2017). Every minute of delay in early defibrillation is a reason for a 9% reduction in neurologically intact survival (Kitamura et al., 2010). Specialized training programs through public programs play a primary role in increasing public awareness of cardiac arrest and the use of early external defibrillation. Public programs can be conditionally divided into workplace early defibrillation programs, early defibrillation programs for individuals and organizations on the front lines - Police, emergency services, and volunteer rescue teams, municipal early defibrillation programs, national early defibrillation programs, with the aim of providing immediate access to AED for use by anyone (including non-medical personnel) wherever and whenever needed (<https://firstaid.bg/mission>). It is recommended to start with AED if available, but if not, CPR is recommended. Anyone can use an AED (Monsieurs K.G., et al, 2015), but it is advisable to have gone through training programs. Some researchers argue that even after the first training module, participants gain skills for AED and CPR, and refresher courses are needed after 7 to 12 months to maintain and build on skills and knowledge for early AED (Woollard M., et al., 2006). The basic rule before using an AED is to place the electrode pads correctly, then follow the voice commands (instructions) issued by the device. The most common reasons street AEDs are used infrequently boil down to insecurity, uncertainty about the sequence of actions, fear of infectious diseases in the victim, the possibility of injuries for which responsibility will be borne, lack of good knowledge, lack of voice, lack of confidence, lack of opportunity for passers-by to locate the AED, clear indications of where the device is placed (Fan K., et al 2017; Brooks B., et al, 2015; Bogle B., et al, 2013; Malta Hansen C., et al. 2017

Results of the Conducted Study

The current study was motivated by the Statement made during the Round Table discussion (September 26, 2019) regarding the provision of first aid for sudden cardiac arrest and the use of an automated external defibrillator (AED) in Bulgaria. '... To encourage the establishment and implementation of programs for placing AEDs in public places and training the population to act in cases of cardiac arrest according to modern guidelines of international organizations...' Over the last 2-3 years, the practice of placing AEDs in workplaces and training employees in performing CPR and early defibrillation in cases of cardiac arrest has been widely adopted in Bulgaria. (<https://www.redcross.bg/news/view?nwid=23933>)

Objective: To investigate

- the awareness of the respondents about cardiac arrest;
- the need for training in the application of early defibrillation with an automated external defibrillator (AED).

Materials and Methods: Survey, historical, and statistical methods were used.

The survey was conducted during the period from April 1 to May 30, 2023. A total of 127 respondents aged 20 to 42 years were included (after obtaining informed consent). The study involved students from the Medical Assistant program at the Angel Kanchev University of Ruse and from the Medical Nurse and Midwifery program at the Medical University of Varna, Sliven Branch. Respondents were provided with an information brochure (IB) containing information about cardiac arrest and the need for early external defibrillation.

Results and Discussion: The survey questions and data were analyzed, summarized, statistically processed, and presented in Table 1.

Table 1. Data from the survey questionnaire

1. Are you familiar with the functions (what it provides) of an AED?	19% - No 39% - Not enough 42% - Sufficient
2. Do you have information about AEDs placed in accessible public places?	32% - No information 68% - Yes (Railway stations, schools, metro, airports, etc.)
3. Is it necessary for educational institutions, offices, and buildings of various companies to have AEDs?	87% - Yes 13% - No
4. Do you have information about training for early AED application?	57% - No information 22% - Only for cardiopulmonary resuscitation (CPR) 21% - Yes
5. Do you have the necessary theoretical knowledge and practical skills to recognize cardiac arrest and apply cardiopulmonary resuscitation (CPR) and early AED?	49% - Yes 25% - Not sufficient 26% - No
6. Do you have a desire to participate as instructors in public programs for early AED application?	94% - Yes 6% - No
7. Do you need additional information about cardiac arrest and early AED, and through what forms of training?	93% - Yes 7% - No
8. Did the information provided to you in the information bulletin (IB) affect your opinion on the need for training to work with AED and the application of early automatic defibrillation?	89% - Yes 11% - No
9. Do you believe that mass education of the population for rapid recognition of cardiac arrest and the performance of early defibrillation can increase survival rates after cardiac arrest?	96% - Yes 4% - No
10. Will you participate in promoting training for early AED?	87% - Yes 13% - No

3. ANALYSIS OF THE SURVEY RESULTS

The responses to the first question indicate that 25% of the respondents do not have information about the functions of AED (Automated External Defibrillator), 36% consider their knowledge insufficient, while 39% have good theoretical and practical knowledge. In the survey, 36% of the participants had no information about the placement of AEDs in public places, while 64% were well informed about their presence in places such as railway stations, schools, subways, airports, and others. Regarding question number 3, 13% of the respondents answered "No," but with the clarification that such devices should be mandatory in public places frequented by many people and located at a distance from medical centers, such as airports, railway stations, subways, and shopping centers. According to 87% of the participants, AEDs should not only be placed in accessible locations but also with appropriate signage. This increases the likelihood of their use and the potential to save human lives.

Regarding the question, "Are you informed about the existence of training for early AED use?" 37% of the respondents do not know about the existence of training programs, 41% are aware of training for cardiopulmonary resuscitation (CPR) only, and 22% have information about specialized training programs for working with AEDs. Regarding the availability of theoretical knowledge for recognizing cardiac arrest and practical skills for applying early AED, half of the respondents believe they have the necessary knowledge that will contribute to their adequate response to the problem. For the other half, knowledge is insufficient or lacking.

Almost all respondents (93%) expressed a desire to enhance their existing theoretical and practical knowledge and skills through various forms of training, such as seminars, lectures, and posters. Furthermore, 94% expressed a willingness to be part of training teams for working with AEDs, while 9% responded negatively due to doubts about their existing knowledge and skills for using AEDs. The information provided in the informational booklet (IB) about cardiac arrest and AEDs influenced 89% of the respondents to answer that training for working with AEDs and the application of early automated defibrillation are necessary. In contrast, 11% responded that it is not

necessary because training is conducted during medical school classes. According to 93% of the respondents, mass education of the population on rapid recognition of cardiac arrest and the performance of early defibrillation will increase survival rates after cardiac arrest. In response to question 10, 87% of the respondents said they would actively participate in promoting education on early AED use among the population. They believe that through various forms of training, this education will provide information on appropriate behavior not only for medical professionals but also for bystanders, potentially saving lives!

4. EXCERPTS

- 1/4 of the respondents lack information about the functions of the Automated External Defibrillator (AED).
- 1/3 do not have information about the placement of AEDs in public places.
- 1/3 are not informed about training for early AED use.
- 93% of the participants responded that mass education of the population in the use of AEDs would increase survival rates after cardiac arrest.
- 94% reported that they have the necessary knowledge to be part of a team conducting training on the proper use of AEDs.

Based on the summarized results of the survey, a general conclusion can be drawn: there is a knowledge deficit regarding cardiac arrest and the need for early defibrillation. This deficit can be compensated for by conducting mass education on the application of early automated defibrillation and familiarizing individuals with the basic characteristics of cardiac arrest. As a result, specialized training and the proper use of defibrillation will increase the percentage of survivors after cardiac arrest.

5. CONCLUSION

The theoretical knowledge and practical skills acquired through specialized training for early automated defibrillation will contribute to the timely recognition of cardiac arrest and the application of adequate life-saving measures. The use of AEDs in such situations plays a crucial role in survival and minimizing severe complications in patients. Many studies and surveys show a high correlation between the successful application of AED and CPR, with critical factors being the knowledge, skills, and willingness of individuals to participate in various aspects of health promotion and prevention. In particular, the desire to work with AEDs and CPR is highlighted. These studies also outline the challenges when working with AEDs and provide a basis for considering what educational modules should be included to reduce uncertainty and insecurity (Susan Ka Yee Chow, 2021).

LITERATURE

- Brooks B., Chan S., Lander P., Adamson R., Hodgetts G.A., Deakin C.D. (2015). Public knowledge and confidence in the use of public access defibrillation. *Heart*.
- Bogle B., Mehrotra S., Chiampas G., Aldeen A.Z. (2013). Assessment of knowledge and attitudes regarding automated external defibrillators and cardiopulmonary resuscitation among American University students. *Emerg. Med. J.*;30:837–841
- Bozov H. (2021). *Emergency Medical Care Guide*. Ed. of the University "Prof. Dr. Asen Zlatarov", Burgas
- Grigorov M., Maznev I. (2015). *Emergencies in internal medicine*. Ed. of the "Vasil Levski" NSA, Sofia
- Kitamura T, Iwami T, Kawamura T et al. (2010). Nationwide public-access defibrillation in Japan. *N Engl J Med*.
- Ministry of Health (2012). *Compendium of protocols for clinical conduct in emergency medicine*. Sofia
- Malta Hansen C., Rosenkranz S.M., Folke F., Zinckernagel L., Tjørnhøj-Thomsen T., Torp-Pedersen C., Sondergaard K.B., Nichol G., Hulvej Rod M. (2017). Lay bystanders' perspectives on what facilitates cardiopulmonary resuscitation and use of automated external defibrillators in real cardiac arrests. *J. Am. Heart Assoc.*
- Monsieurs K.G., Nolan J.P., Bossaert L.L., Greif R., Maconochie I.K., Nikolaou N.I., Perkins G.D., Soar J., Truhlar A., Wyllie J. (2015). *European resuscitation council guidelines for resuscitation . Section 1. Executive summary*. *Resuscitation*.
- Nichol G, Thomas E, Callaway CW et al. (2008). Regional variation in out-of-hospital cardiac arrest incidence and outcome. *JAMA*.
- Susan Ka Yee Chow, (2021). *Int J Environ Res Public Health* 2021 Feb; Bystanders' Views on the Use of Automated External Defibrillators for Out-of-Hospital Cardiac Arrest: Implications for Health Promotions
- Holmberg M.J., Vogensen M., Andersen M., Donnino M.W., Andersen L.W. Bystander (2017). Automated external defibrillator use and clinical outcomes after out-of-hospital cardiac arrest: A systematic review and meta-analysis. *Resuscitation*.

- Pollack R.A., Brown S.P., Rea T., Aufderheide T., Barbic D., Buick J.E., Christenson J., Idris A.H., Jasti J., Kampp M., et al.(2018). Impact of bystander automated external defibrillator use on survival and functional outcomes in shockable observed public cardiac arrests. *Circulation*.
- Fan K., Lui C., Leung L.(2017). Public access defibrillation in Hong Kong. *Hong Kong Med. J.* 23:635–640. doi: 10.12809/hkmj176810
- Woollard M., Whitfield R., Newcombe R.G., Colquhoun M., Vetter N., Chamberlain D. (2006). Optimal refresher training intervals for AED and CPR skills: A randomised controlled trial.
- Wyatt ,J. R. Taylor, K. de Wit, E. Hotton, (2020). *Oxford Handbook of Emergency Medicine*, Oxford University Press, p. 48
- Out-of-Hospital Chain of Survival in 2020. Available online: <https://cpr.heart.org/en/resources/cpr-facts-and-stats/out-of-hospital-chain-of-survival>
- <https://acibademcityclinic.bg/cardio/novini/detali/izpolzvaneto-na-defibrilator-pri-surdechen-arest-uvelichava-prezhivyaemostta-do-75>. 2024
- <https://www.mayoclinic.org/diseases-conditions/sudden-cardiac-arrest>, 2024
- <https://www.heart.org/en/health-topics/cardiac-arrest>, 2024
- <https://firstaid.bg/mission/>, 2024