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Education and age affect skill acquisition and retention in lay rescuers after a European Resuscitation Council CPR/AED course

Konstantina Papalexopoulou, MSc [a,†], Athanasios Chalkias, PhD [a,†,*], Ioannis Dontas, MSc [a], Paraskevi Pliatsika, MSc [a], Charalampos Giannakakos, MSc [a], Panagiotis Papapanagiotou, MSc [a], Afroditi Aggelina, MSc [a], Theodoros Moumouris, MD [a], Georgios Papadopoulos, PhD [b], Theodoros Xanthos, PhD [a]

[a] National and Kapodistrian University of Athens, Medical School, MSc "Cardiopulmonary Resuscitation", Athens, Greece
[b] University of Ioannina, School of Medicine, Department of Anesthesiology, Ioannina, Greece

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ABSTRACT

Objectives: To examine whether education and age affect skill acquisition and retention in lay rescuers after a European Resuscitation Council (ERC) CPR/AED course.
Background: Because of the importance of bystander CPR/AED skills in the setting of cardiac arrest, acquisition and retention of resuscitation skills has gained a great amount of interest.
Methods: The ERC CPR/AED course format for written and practical evaluation was used. Eighty lay people were trained and evaluated at the end of the course, as well as at one, three, and six months.
Results: Retention of CPR/AED skills improved over time, recording the lowest practical scores at one month after initial training and the lowest written scores at initial training. In practical evaluation scores, when examined longitudinally, age presented a significant adverse effect and higher background education presented a non-significant positive effect. Moreover, regarding written evaluation scores, when examined longitudinally, education presented a significant positive effect while age did not significantly correlate with written scores.
Conclusions: Education and age affected retention of CPR/AED skills in lay rescuers. Also, our results suggest that the ERC CPR/AED course format may be poorly designed to discriminate between participants with different levels of practical and written resuscitation skills and merit a thorough investigation in future studies.

Introduction

Cardiac arrest is a leading cause of death worldwide and the most common cause of mortality over the age of 40.[1] In case of cardiac arrest, chances of survival are minimal, unless a lay rescuer starts basic life support (BLS) and uses an automated external defibrillator (AED), if present.[2,3] Cardiopulmonary resuscitation (CPR) improves the chances of successful resuscitation from out-of-hospital cardiac arrest,[4] while CPR/AED use from bystanders may double or triple survival of cardiac arrest victims.[5–7]

Because of the importance of bystander CPR skills in the setting of cardiac arrest, CPR/AED skill acquisition and retention has gained a great amount of interest and training of general population is of outmost importance.[8,9] However, although the aim of educational interventions is to ensure that learners acquire and retain the resuscitation skills, BLS knowledge and skills deteriorate in as little as three to six months.[10] To our knowledge, only one study has investigated potential factors affecting BLS acquisition. In this study, the authors concluded that traditional BLS training is less effective in individuals aged 40 years or older.[11] In addition, although first responders with higher qualification levels are more likely to acquire the skill of defibrillation successfully,[12] we have recently showed that distribution of CPR/AED manuals one month prior to the course has no effect on skill acquisition in lay-people.[13] With this study, we aimed at examining whether education and age affect skill acquisition and retention in lay rescuers after a European Resuscitation Council (ERC) CPR/AED course.

Abbreviations: BLS, basic life support; AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; ERC, European Resuscitation Council.

* Corresponding author. Tel.: +30 210 4133992; fax: +30 210 6972396.
E-mail address: thanoschalkias@yahoo.gr (A. Chalkias).

† These authors contributed equally to the study.

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Methods

The study was conducted in Athens, Greece between May 2011 and May 2012, recruiting lay-people who had applied on their own will for CPR/AED training at a scientific society, namely the Hellenic Society of CPR, which was authorized to provide such accreditation. The study was additionally approved by the Postgraduate (MSc) Study Program "Cardiopulmonary Resuscitation" of the Medical School of the National and Kapodistrian University of Athens. Participants were all individuals aged >18 years. Exclusion criteria were previous training in CPR/AED and any health care profession. Participation to the study was voluntary with participants giving informed consent.

Questionnaire development

A theoretical knowledge questionnaire consisting of multiple choice questions according to the ERC 2010 guidelines were used to evaluate the level of candidates' CPR/AED knowledge. All questions were prepared by the authors of the present study. Any questions on which consensus about the correct answer was not easily achieved were removed from the questionnaire. After receiving institutional review board approval, the questionnaire was initially tested within a group of 12 CPR/AED course directors from a training center in Athens, Greece. The questionnaire was also sent to local resuscitation experts for advice. The few questions that were not clear were removed from the questionnaire.

The questionnaire consisted of two parts, i.e. demographics and 10 multiple choice theoretical knowledge questions (course test) with only one correct answer that surveyed familiarity with the 2010 ERC CPR/AED guidelines (Appendix A). Each of the questions of the course test surveying theoretical knowledge was followed by four possible answers, one of which was correct. One point was allocated to any correct answer with no negative marking; therefore, the total maximum score was 10. The test was scored in order to ensure a uniform theoretical knowledge among the participants of the study, while competency was arbitrarily set and was indicated when the candidate answered correctly at least eight questions (80%).

Course test reliability

A pilot survey among 25 lay rescuers, which was not included in the results of the main study, was performed. All participants in the pilot survey found the course test clear; therefore, no further modifications were necessary. The reliability of the test was validated using a test–retest procedure. Twelve of the previously surveyed respondents were randomly selected for another interview one week later. The mean level of answer agreement was 97% between the two sets of results (range, 90%–100%; standard deviation, 2%).

CPR/AED course format

During the study period, three ERC CPR/AED courses with lay-people were organized as previously described.[14] Each course lasted approximately half a day and consisted of skill demonstrations and hands-on practice, with a minimum number of lectures. The ratio of instructor to candidates was approximately 1:6, with at least one manikin and one AED for each group of six candidates.[15] The manikin used was 'Little Anne' (Laerdal Medical Corporation, NY, USA). The AED used was the Lifepak 500T AED Training System (Medtronic Physio-Control, USA) with self-adhesive defibrillation pads. An AED connector that simulates different cardiac arrest rhythms was also used for training purposes.

The instructor group comprised of ERC-certified Course Directors, while all lay-people were instructed by the same group to ensure uniform training. All instructors were certified providers, nominated by the course faculty as having instructor potential, who have successfully completed the CPR/AED instructor course and have achieved instructor status after being successfully monitored as instructor candidates for a minimum of two CPR/AED courses. The Course Directors had participated as instructors in more than 15 CPR/AED courses and have achieved their status after being monitored in at least two courses as co-directors. The participants were formally evaluated at the end of the course, while the evaluation procedure consisted of two distinct parts: a 10-min written test (course test – Appendix A) which preceded a simulated cardiac arrest scenario.

After a 2 min introduction by two instructors, the trainee took the role of the rescuer and had to recognize cardiac arrest and effectively provide CPR according to CPR/AED algorithms and recommendations. The scenario given to each participant was a patient, found unconscious, who required the use of an AED in a public place. The initial cardiac rhythm when the AED was attached was ventricular fibrillation. The same scenario was used for each participant, who was then asked to perform the CPR/AED algorithm in real time (defibrillation – 2 min CPR–defibrillation), until professional care arrived. Forty four parameters were evaluated totally by the two instructors (Appendix B). These points have been described in a previous study,[14] but we excluded the check for signs of circulation or carotid pulse, because the trainees were not health care professionals. The instructors used skills testing sheet criteria to determine if the trainee has demonstrated each step of the skill correctly and to record the student's results. Each parameter in the checked list (Appendix B) was considered to be completed successfully, only if both of the instructors agreed, while individual written feedback was given to the participants after the end of the tests.

One, three, and six months after completing their initial training, the participants were re-evaluated in predetermined sessions. A written remainder was given at the end of the course and was also send via email one month prior to the second and third re-evaluation. We chose these time intervals for performing the re-evaluation considering that BLS knowledge and skills deteriorate in as little as three to six months,[10] while traditional BLS training is less effective in individuals aged 40 years or older.[11]

The group of instructors and the evaluation procedure was identical to that of the initial course. The assessments were performed by two investigators who did not instruct in any of the courses. Each re-evaluation was done at the same venue and the participants had to complete the same course test without having any complementary CPR/AED training in the meantime. The scenario, the manikin, and the AED were also identical to these mentioned above, while the participants were evaluated with the same check list.

Statistical analysis

Statistical analysis was conducted using Stata version 9.0 (StataCorp LP, College Station, TX, USA), and SPSS version 15.0 (SPSS Inc, Chicago, IL, USA). Due to insufficient normality in distribution and small sample size, we compared overall evaluation scores between the four different sessions (time-points) using the non-parametric Wilcoxon sign-rank test. We also analyzed evaluation scores in relation to trainee characteristics for each of the evaluation sessions, either by using the non-parametric Mann–Whitney test, due to insufficient normality and small sample size, for categorical factors, or by using simple linear regression for age, which was measured in a continuous manner. Finally, we further analyzed