

Original Research

Attitudes of Healthcare Professionals Involved in Cardiology Practice Towards Key Points of Contemporary Guidelines on Resuscitation

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Introduction: Cardiopulmonary resuscitation (CPR) is not always executed in compliance with contemporary guidelines and the quality of CPR may differ among hospitals within the same country or among categories of healthcare providers and medical specialties. The aim of this study was to assess attitudes of cardiology healthcare professionals towards CPR guidelines.

Methods: An anonymous questionnaire was posted online during 2009. Responders were asked about their age, gender, occupation, and training/experience in CPR. Responders' attitudes towards CPR were assessed using 7 questions regarding the accuracy of their opinions about the automated external defibrillator, public defibrillation programs, CPR performance, and therapeutic hypothermia. A score (0 to 7) was formed by assigning grade 1 to answers that accorded with European Resuscitation Council (ERC) guidelines and grade 0 to all other answers. The reliability analysis for this score yielded a Cronbach's alpha of 0.78.

Results: There were 544 responders (158 females), median age 34 years (30, 40). Median score was 5 (3, 6). Attending an ERC resuscitation course (beta=0.33, SE beta=0.05, p<0.001), age (beta=-0.15 SE beta=0.05, p=0.002), involvement in >10 CPRs /year (beta=0.19, SE beta=0.05, p<0.001), and being a physician (beta=0.17, SE beta=0.05, p=0.001) were all independent predictors of score. Attendance at an ERC course (OR: 2.7 [1.5 to 4.7]), being a physician (OR: 2 [1.3 to 5]) and involvement in >10 CPRs /year (OR: 1.7 [1.1 to 2.7]) were also independent predictors for attitudes that accorded with contemporary guidelines regarding therapeutic hypothermia.

Conclusions: Attending an ERC resuscitation course, frequent involvement in CPR attempts, younger age, and being a physician were all independent predictors for more positive attitudes towards the guidelines. These factors, with the exception of age, were also associated with positive attitudes towards the implementation of therapeutic hypothermia.

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Evidence-based practice guidelines aim to advise healthcare providers towards achieving the best outcomes for patients through a better-coordinated approach to cardiopulmonary resuscitation (CPR). Advanced (ALS) and intermediate life support courses¹ are standard practice for the implementation

of these guidelines among healthcare providers, but the impact of such training on outcomes after cardiac arrest (CA) is controversial and is emphasized as a key research item in current CPR guidelines.²⁻⁷ Moreover CPR education is not uniform and may differ even among institutions or universities in the same country.⁸ Thus

CPR is not always executed in compliance with contemporary guidelines and the quality of CPR may differ among hospitals within the same country, reflecting important diversities among the categories and medical specialties of involved healthcare providers, but also the attitudes of caregivers towards CPR.⁹⁻¹²

The present study was performed in order to evaluate the attitudes of healthcare professionals involved in cardiology practice towards key points of contemporary guidelines on resuscitation.

Methods

The study was performed using a questionnaire, which remained online during 2009 at the website of the Hellenic Cardiological Society (www.hcs.gr). It consisted of 7 questions regarding healthcare providers' practice and perceptions of CPR. Each question was in multiple choice form, where the choices of answer were the most frequent answers given to an "open" questionnaire with the same questions, which was answered by 50 healthcare professionals.

Statistical analysis

The validity of the final score was tested using Cronbach's alpha for binary outcome variables. Kruskal-Wallis ANOVA with Duhn's *post hoc* analysis was used for comparisons of numerical variables between groups of responders regarding previous seminar attendance. Corresponding comparisons of qualitative data were performed using the chi-square test or Fisher's exact test, as appropriate. Forward stepwise regression analysis was performed for all possible predictors in order to identify the independent predictors for score. Multiple logistic regression was used to identify independent predictors relating to views on therapeutic hypothermia.

Results

There were 544 responders to our questionnaire. As shown in Table 1, most of them were male physicians practicing in capital cities and in hospitals for the National Health System (NHS). Also, the majority had attended a CPR seminar within the last 5 years and regularly performed some CPR treatments per year.

Attitudes towards CPR

The number of responses that were in accordance

Table 1. Characteristics of responders to the online questionnaire. Data are n (%) unless otherwise indicated.

Demographics:		
Female sex	158	(29)
Age, years median (interquartile range)	34	(30,40)
Occupation characteristics (540 responses):		
Country capital	335	(62)
Physician	414	(76)
National health system employee	354	(65)
Hospital practitioner	385	(71)
Time since last attended CPR course (531 responses):		
<5 years	362	(67)
5 to 10 years	65	(12)
>10 years	19	(3)
Never attended	85	(16)
Kind of seminar attended (526 responses):		
ERC	311	(57)
Non ERC	130	(24)
Never attended	85	(16)
No of CPRs per year (530 responses):		
No CPR	97	(18)
<5 per year	138	(25)
5-10 per year	89	(16)
>10 per year	206	(38)

CPR – cardiopulmonary resuscitation; ERC – European Resuscitation Council

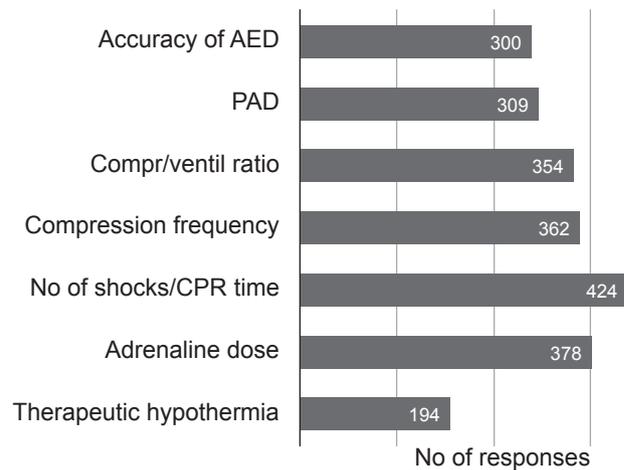


Figure 1. Number of responses in accordance with CPR guidelines. AED – automatic external defibrillator; CPR - cardiopulmonary resuscitation; PAD – public access defibrillation program.

with CPR guidelines across the questionnaire items is shown in Figure 1.

The majority of responders (n=300) believed that rhythm recognition by an automated external defibrillator (AED) is accurate, but 140 of them thought that it needs further improvement; 83 had other (unspecified) opinions and some did not know or did not respond.

Three hundred nine responders adopted the concept that public access defibrillation programs are clearly indicated, but a significant number of them (n=190) thought that they would be either premature or very difficult to implement.

Regarding compression to ventilation ratio, 354 responders answered that they would recommend a 30:2 ratio, while 134 would recommend a 15:2 ratio (presumably in accordance with a previous guideline); 40 favored continuous chest compressions, while the rest would either recommend a different compression to ventilation ratio, did not know, or did not respond.

The majority of responders would compress with the currently recommended frequency of 100 /min. The second most frequent answer was to compress with a frequency of 60 /min. The rest would recommend a different compression rate, did not know, or did not respond.

Four hundred twenty-four people would give 1 shock and then perform 2 min of CPR. Sixty would give 3 shocks and then perform 1 min CPR, while the rest would act in a different unspecified manner or would not answer the question.

Three hundred seventy-eight people would give 1 mg of adrenaline every 3-5 minutes, while most of the answers that were discordant with the guidelines favored higher adrenaline doses.

Regarding therapeutic hypothermia, 194 people believed that it increases survival with an intact neurological condition, 72 believed that it is effective but inapplicable, 118 thought that this treatment is still investigational, 36 believed it to be of questionable effectiveness, 74 had another opinion not included in the questionnaire, while 50 did not know or did not respond.

Score validation and associations

Answers that were in concordance with the 2005 European Resuscitation Council (ERC) guidelines were scored as 1 and all other answers were scored as 0. Individual scores for each question were then totaled to give a score from 0 to 7. The median score was 5 (3, 6). Cronbach's alpha for this score was 0.78. Three groups of interest were formed regarding previous seminar attendance: people who had attended an ERC seminar (n=311), those who had attended a non-ERC seminar (n=85), and those who had never attended a seminar (n=130). Only a very small group of 7 people had attended both an ERC seminar and a

non-ERC seminar, and this group did not affect statistical outcomes, whether considered as having attended either an ERC or a non-ERC seminar. As no significant information could be obtained for this particular category within this small group it was excluded from the analysis.

There were no differences among these three groups regarding age, sex, location of occupation, or frequency of hospital practitioners and NHS workers (Table 2). Those who had attended an ERC seminar used the internet as an educational resource as frequently as those with no seminar, whereas they were less likely to report published medical literature as a source of medical education. Responders who had been trained in ERC seminars were much more likely to have attended some kind of CPR seminar within the past 5 years. They also seemed to have a significantly higher possibility of being involved in actual CPR cases during daily practice than the rest of the responders. They achieved higher scores than both the other groups.

Multiple regression analysis revealed that age, being a physician, having attended an ERC seminar, and taking part in >10 CPRs per year were independent predictors of score (Table 3). Multivariate predictors of score in the questionnaire are shown in Figure 2. The most significant difference was found in younger responders (age <35 years).

Attitudes towards therapeutic hypothermia

Because of its special interest, an analysis was performed regarding attitudes towards therapeutic hypothermia. Results for univariate and multivariate analysis are presented in Table 4. Being a physician, attending an ERC seminar, and performing >10 CPRs /year were significant predictors, after adjusting for all the other variables.

Discussion

Using an online questionnaire, we tried to identify how attendance at an ERC seminar is associated with healthcare providers' attitude towards CPR performance, AED capabilities, public defibrillation programs and therapeutic hypothermia.

We chose rather strict "all or none" criteria in validating answers as concordant or discordant with current guidelines. This carries the risk of ending up in arbitrary, overzealous annihilation of attitudes of healthcare professionals that generally do not disre-

Table 2. Differences in responders' characteristics among the study groups. Data are n (%) unless otherwise indicated.

	No previous seminar n=85	ERC seminar n=311	Non ERC seminar n=130	p
Age, median (IQR)	33.5 (29,41)	34 (31,40)	35 (29,40)	0.91
Sex	25 (29)	81 (26)	44 (34)	0.78
Practicing in capital	52 (61)	198 (64)	76 (58)	0.58
Hospital practitioners	56 (66)	229 (74)	95 (73)	0.36
Physician	62 (73)	226 (73)	95 (73)	0.99
NHS	53 (62)	205 (66)	89 (68)	0.65
Time since last seminar:				
>10 years		10 (3)	9 (7)	0.11
5-10 years		23 (7)	39 (30)	0.07
<5 years		270 (87)	82 (63)	<0.001
No of CPRs per year:				
None	21 (25)	40 (13)	27 (21)	0.01
1-5	29 (34)	71 (23)	30 (23)	0.09
5-10	9 (11)	44 (14)	30 (23)	0.02
>10	21 (25)	142 (46)*†	35 (27)	<0.001
Score, median (IQR)	4 (2,5)	5 (4,6)*†	4 (2,5)	<0.001
Other sources of education:				
Internet	40 (48)	126 (41)	47 (22)	0.28
Medical literature	32 (39)	68 (22)*†	53 (42)	<0.001
Mass media	1 (1)	5 (2)	6 (5)	0.22

*p<0.05 vs. no seminars group; †p<0.05 vs. non ERC seminar group.
IQR – interquartile range. Other abbreviations as in Table 1.

Table 3. Multivariate predictors of score.

	Regression beta (SE beta)	T	p
Age	-0.15 (0.05)	-3.1	0.002
Being a physician	0.17 (0.05)	3.4	0.001
Attendance at ERC seminar	0.33 (0.05)	6.68	<0.001
>10 CPRs /year	0.19 (0.05)	3.77	<0.001

Abbreviations as in previous tables.

gard guidelines, but might, for example, express skepticism regarding the potential for guideline implementation. It has been shown, however, that pessimistic attitudes towards CPR affect medical and nursing students' CPR practice and may impede the implementation of guidelines.¹³ Hence, it is not only ignorance but also pessimistic attitudes that need to be overcome in order to enhance the implementation of guidelines. Thus, we thought that a strict way of validating answers to the questionnaire was more appropriate.

A wide variation was noted in the answers to each item of our questionnaire. The fact that possible answers were picked from the most popular beliefs among healthcare providers may have con-

tributed to this. Earlier studies have shown that attitudes of professional caregivers may vary widely, because they are affected by several heterogeneous factors, such as conscience, personal experience and education.^{11,14}

Despite unresolved issues about the impact of ALS training on patient outcomes and knowledge retention,¹⁵ there is evidence that implementation of ALS capabilities may be useful, not only for in-hospital CPR performance,^{3-5,16} but also in pre-hospital settings of acute patient treatment by emergency medical system personnel.¹⁷⁻¹⁸ Besides, giving large numbers of laypeople basic life support training may increase bystander CPR attempts.¹⁹ In our study, having attended an ERC seminar was associated with more positive attitudes towards resuscitation guidelines in comparison with healthcare providers who had not attended any seminars at all. This was not evident with other sorts of seminars. Some particular characteristics of ERC seminars may account for this difference. The endorsement of principles of simulation-based teaching that have been substantiated in other fields of training, such as aviation and military resuscitation teams, may be of key importance.²⁰ In contrast to most other CPR teaching procedures, they

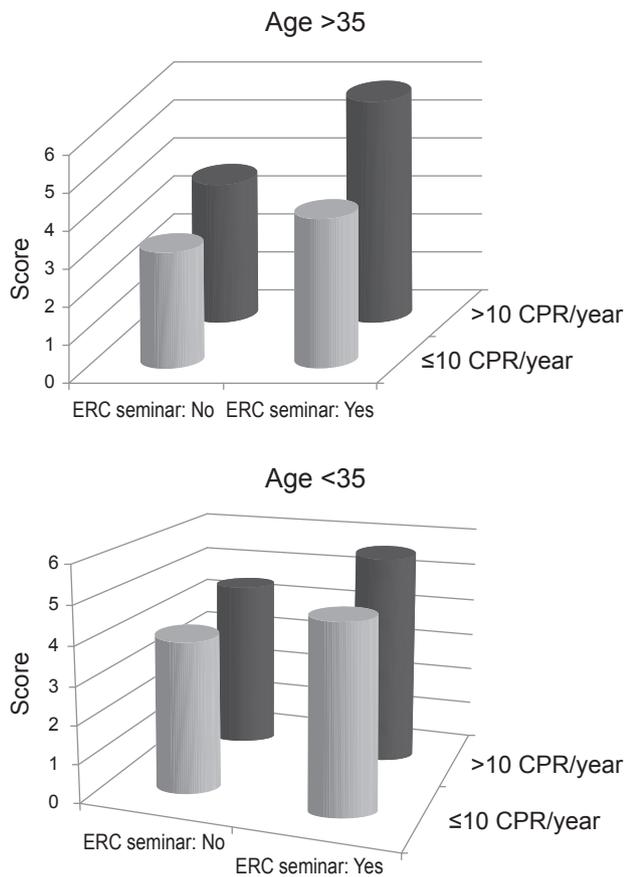


Figure 2. Multivariate predictors of score in the questionnaire. CPR – cardiopulmonary resuscitation; ERC – European Resuscitation Council.

are based primarily on small-group, scenario-based, interactive teaching rather than large-group lecture-based teaching.¹ Also, the fact that seminar content and structure are sensitive to feedback by trainees and are periodically reevaluated through an international procedure²¹ may have contributed to the positive impact of this kind of seminars on healthcare providers attitude.

Previous research has emphasized the need for refresher activities in order to help practitioners retain theoretical knowledge and practical skills after a single CPR course.²²⁻²⁴ In our experience, refresher training is not common in Greece. This reflects the relatively recent appearance of ERC seminars and the limited number of seminars in comparison to the anticipated needs. Therefore, priority is given to those being trained for the first time over those seeking repeat training. The absence of a special recertification policy by the ERC in order to maintain competency and the voluntary basis for CPR training

Table 4. Univariate and multivariate predictors of attitudes towards therapeutic hypothermia.

Univariate predictors			
	OR (95% CI)	p	
Age >median	1.43 (0.98–2.1)	0.06	
Female sex	1.6 (0.37–1.02)	0.06	
Capital location	2 (0.7–1.5)	0.96	
Physician	2 (1.3–3.3)	0.002	
Hospital practice	1.9 (1.2–2.9)	0.005	
NHS	1.6 (1.1–2.4)	0.02	
Time since last seminar:*			
<5 years	2.4 (1.4–4.1)	0.002	
5 to 10 years	1.8 (0.9–3.7)	0.11	
>10 years	1.6 (0.5–4.9)	0.38	
Kind of seminar:*			
Non ERC	1.3 (0.7–2.6)	0.41	
ERC	3.5 (2–6.3)	<0.001	
No of CPRs /year [†]			
<5	1.1 (0.6–2.1)	0.65	
5 to 10	1.6 (0.8–3)	0.17	
>10	2.7 (1.6–4.7)	0.001	
Multivariate predictors			
	OR (95% CI)	p	
Being a physician	2 (1.3–5)	0.02	
Attendance at ERC seminar	2.7 (1.5–4.7)	0.001	
>10 CPRs /year	1.7 (1.1–2.7)	0.04	

*Compared to not having attended seminars. †Compared to no CPR. OR – odds ratio; CI – confidence interval. Other abbreviations as in previous tables.

in Greece may also contribute to this. It was thus not within the items of our questionnaire whether participants had attended an ERC CPR refresher course. The very small number of responders who had attended both an ERC and another type of CPR course precluded the evaluation of the interaction between ERC and other kinds of seminars.

There are numerous reports of differences among several categories of healthcare professionals regarding knowledge, intention to act, and attitudes towards CPR.^{13,25-27} In our study, doctors had attitudes more in accord with contemporary guidelines. There is no direct evidence to explain this observed difference between doctors and nurses, who practically made up the group of non-physicians, in our study. Several factors, such as lack of education,²⁸ pessimistic conceptions about CPR outcomes, inadequate self-appraisal, and recalling CPR as a very stressful event have all been reported to adversely affect nurses' attitudes towards CPR. It has also been shown that very few of

them think that guideline changes may positively affect nurses' roles during CPR.^{13,29} In order to redress these issues, CPR training strategies better tailored to nurses' needs and effectively targeted towards encouraging them to appreciate the need to update CPR skills should be developed.^{7,30}

There are several reports correlating the age of both healthcare professionals and lay rescuers with their attitude and practice towards CPR and CPR training. More aged professionals seem to think in a different way when confronted with decisions about CPR in comparison to their younger counterparts. This has been shown for decisions regarding initiation and termination of CPR, and also personal preferences for cardiopulmonary resuscitation for themselves. Moreover, aging seems to affect the quality of performed CPR and level of care for the relatives of CA victims.^{10,31} Older lay rescuers seem to have a different motivation for being trained in CPR and are affected in a different manner by the use of new technologies during training.²⁹ The reasons for the age-related differences that were observed in our study can only be speculated upon. Younger nurses and physicians are more often the first to be engaged in CPR attempts and may thus be more actively interested in recent advances in the field, while older colleagues probably feel more confident with their knowledge and skill status, especially if treating CA is not frequently encountered in their everyday practice.

In studies regarding attitudes of healthcare professionals towards CPR it is not always easy to distinguish between the effects of age and experience gained with increasing years of practice. This was not the case in our study, because age and experience in CPR, at least as judged by the number of CA treatments per year, had a different impact on the achieved score. Older individuals had lower scores, while taking part in >10 CPR procedures per year had an impact that was independent of age and was associated with higher scores.

Numerous data show that professional experience and CPR practice are relevant to attitudes towards CPR. Less experienced doctors are less likely to start CPR, while age and level of experience tended to reduce the propensity to engage in mouth-to-mouth CPR.^{10,26} Having attended real CPR situations in the past is particularly effective in improving young doctors' and nurses' confidence in being part of the cardiac arrest team. This was evident in the attitudes of young doctors who had experience of real CPR during their training.^{13,32-34} This is also the case among critical care nurses, who generally attend

greater numbers of CA with higher rates of successful outcomes and thus demonstrate increased levels of personal confidence with knowledge of CPR skills.²⁹

Attitudes towards hypothermia

Hypothermia is a top priority, as it is one of the most life-saving therapies in CPR, with the number needed to treat being just 6. Unfortunately it is characterized by low implementation rates worldwide.³⁴⁻³⁶ In our study, it was the item with the greatest number of answers that were discordant with CPR guidelines. ERC seminars and frequent practice of CPR were independent predictors of a positive attitude towards the science behind and implementation of therapeutic hypothermia. In a recent report from Canada, treating more than 10 CA per year is a strong independent predictor for the adoption of therapeutic hypothermia.³⁷ In that study, being a physician for less than 10 years was also an independent predictor for the adoption of hypothermia. According to the authors, the finding that more experienced physicians are less likely to adopt therapeutic hypothermia may reflect more recent exposure of a younger physician to academic centers and the associated emphasis on novel therapies. As already mentioned in our study, increasing age was associated with a worse overall score for attitudes accordant with current guidelines, but not with worse attitudes towards therapeutic hypothermia. Colleagues in the higher age groups may not be the first to be involved in the initial steps of CPR procedure, but are likely to deal with survivors of CA and post-resuscitation care and thus may be more sensitive to issues regarding organ protection after CA.

Limitations of the study

Our questionnaire remained on the web for one year instead of being administered to a prespecified group of healthcare providers who would be more representative of the corresponding population. It is possible that people more often involved or interested in CPR would be more likely to complete the questionnaire, and thus the overall picture might be optimistic with regard to reality. We thought, however, that the chance of getting answers from people who are not interested in CPR might be difficult anyway, and so we decided upon an open-access questionnaire. An additional point of concern is that answers to the online questionnaire may have been

formed under a diversity of circumstances and time availability among various responders and this may have been a source of unmeasured heterogeneity in our results.

Conclusions

Attending ERC resuscitation seminars is independently associated with healthcare professionals' positive attitudes towards contemporary CPR guidelines. The wide spread of simulation-based education seems important for implementing positive attitudes towards guidelines and guideline implementation itself. Physicians had the most positive attitudes, and this was particularly true for those treating more than 10 CA per year. The same factors were positively associated with positive attitudes towards therapeutic hypothermia, which was the item with the most discordant answers, despite its paramount importance. Increasing age had a negative impact on the overall score evaluating accordance of answers with CPR, but was not inversely associated with attitudes towards therapeutic hypothermia.

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