

## Original Research

# Assessment of Nursing Staff's Theoretical Knowledge of Cardiovascular Resuscitation in an NHS Public Hospital

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Key words: **Basic life support, cardiopulmonary resuscitation, nurse, education.**

**Introduction:** The effective provision of cardiopulmonary resuscitation (CPR) increases patient survival and reduces in-hospital mortality. Nursing staff, as front-line healthcare professionals, are often the first present at cardiovascular arrests and respond by providing CPR. Their training has an impact on the efficiency of CPR and consequently on health outcomes; thus, assessment of their status in that respect may provide useful information for decision making.

**Methods:** A cross-sectional study was undertaken in an NHS hospital in Greece to assess the theoretical knowledge of nurses and assistant nurses in relation to CPR. The study population surveyed consisted of nurses and assistant nurses of a specific public hospital.

**Results:** The study revealed that nursing staff had poor theoretical knowledge, with a mean score for correct answers in the written test of  $50.6 \pm 25.9\%$  and a mean  $4.1 \pm 2$  correct answers. Fifty-three percent of participants reported taking part in a refresher course after attending a first course, while only 13.2% had participated in a relevant training program during the last 6 months prior to the study. Registered nurses who possessed a university ( $p=0.016$ ) or a technological institution ( $p<0.001$ ) diploma, achieved 36.1% and 20.9% higher mean scores, respectively, in the written test in comparison to assistant nurses. The vast majority (91.9%) of the participants expressed their willingness to participate in CPR training courses.

**Conclusions:** It is crucial for nursing staff to participate in CPR courses in order to refresh and update their theoretical knowledge and performance skills and consequently to improve the safety and effectiveness of care.

Manuscript received:

March 26, 2013;

Accepted:

May 21, 2014.

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**T**he World Health Organization (WHO) estimates that 17 million people died in 2008 from cardiopulmonary diseases, which are consequently classified as the leading causes of death among all non-communicable diseases.<sup>1</sup> Cardiopulmonary resuscitation (CPR) reduces in-hospital cardiac arrests and related deaths, when patients receive CPR promptly from adequately trained and specialized healthcare professionals.<sup>2,3</sup> Because of the nature of their profession, nurses spend significant time

alongside patients and are often the first to attend at in-hospital cardiovascular arrests; they are thus the ones who respond by providing CPR.<sup>4</sup> Although their contribution to effective care delivery is crucial, either individually or as a member of a rapid response team, studies have often detected that they have poor knowledge and skills in light of international guidelines and recommendations.<sup>5,6</sup> Training programs in CPR may augment nurses' theoretical knowledge and may make a significant contribution to the elimination of

their anxiety and an increase in their self-confidence and effectiveness in dealing with a cardiac arrest, individually or as members of a team.<sup>7-9</sup> Moreover, such training and competence development should be continuous, as studies have observed a significant deterioration of CPR knowledge and skills as early as three months after attending a training program.<sup>10,11</sup> Therefore, given the importance of CPR in delivering effective care and protecting human life, healthcare organizations must organize training programs on an ongoing basis, in order to keep healthcare professionals competent. In this light a survey was undertaken in a public hospital in Greece to assess their knowledge in this field in order to inform policy and decision making.

## Methods

The aim of the study was to evaluate the theoretical knowledge of nurses in CPR and their participation in CPR training programs. Thus, randomly selected nurses and assistant nurses from across all units in a 350-bed National Health Service hospital located in Athens, the capital city of Greece, were surveyed. Permission for undertaking the survey was granted by the hospital's Administration Board and ethics committee. Self-reported questionnaires were given in an envelope, containing a letter describing the personal data of researchers, the aim of the study, and details about its ethical aspects (anonymity and voluntary participation). Participants replied anonymously and returned the questionnaire to the nurse manager of the ward in a sealed envelope. The study was conducted from May 2012 to September 2012. One hundred thirty-six individuals completed the questionnaires out of the 150 asked to participate in the study (response rate 90.7%).

After permission from the original authors, researchers used the instrument developed by Xanthos et al,<sup>12</sup> which consists of 23 questions divided into two parts. The first part includes 14 questions that refer to the demographic characteristics, working status, basic life support (BLS) training, and knowledge self-assessment. In the second part, eight multiple-choice questions (written test) are used to assess the theoretical knowledge of BLS, according to the International Liaison Committee on Resuscitation (ILCOR) 2005.<sup>13</sup> The internal reliability of the questionnaire has been tested and its Cronbachs' alpha coefficient was 0.70.

Continuous variables were quantified and are

presented as mean  $\pm$  standard deviation, while categorical variables are presented in terms of absolute and relative frequencies. The normality assumption was evaluated with the Kolmogorov–Smirnov criterion and probability plots. The variables appeared to exhibit a reasonably normal distribution and hence parametric analysis methods were used. Student's unpaired t-test and one-way ANOVA were used to identify differences in the mean scores of the answers obtained. Pearson's correlation coefficient was used to identify correlations in the case of continuous variables. Variables that were significantly different ( $p < 0.2$ ) in the bivariate analysis were entered into a backward stepwise multivariate linear regression analysis. We estimated adjusted beta coefficients with 95% confidence intervals for the factors included in the model. All tests of statistical significance were two-tailed, and p-values  $< 0.05$  were considered statistically significant. Statistical analysis was performed using the Statistical Package for Social Sciences software (IBM SPSS 19.0 for Windows, IBM SPSS Inc., Chicago, IL, USA).

## Results

The demographic characteristics of the participants are shown in Table 1. Performance in the written test and the results in each of the 8 multiple-choice questions are shown in Tables 2 and 3, respectively. The majority (42.6%) of participants assessed their theoretical knowledge in CPR as good, 33.8% as moderate, 15.4% as very good, 5.1% as not good, and only 2.9% as excellent. The mean score for correct answers in the written test was  $50.6 \pm 25.9\%$  and the mean number of correct answers was  $4.1 \pm 2$ . Bivariate analysis of the demographic characteristics and the mean score for correct answers are shown in Table 4. Multivariate linear regression analysis identified that only the educational level was significantly correlated with the performance in the written test. Nurses who had graduated from university ( $p = 0.016$ ) or a technological institution ( $p = 0.001$ ) achieved 36.1% (beta coefficient: 36.1%, 95% confidence interval: 6.5 to 62.9) and 20.9% (beta coefficient: 20.9%, 95% confidence interval: 12.2 to 29.6) higher mean scores, respectively, in the written test than assistant nurses.

## Discussion

Cardiopulmonary resuscitation has been recognized

**Table 1.** Demographic characteristics of survey participants.

Sex:	
Female	116 (85.3)
Male	20 (14.7)
Age	37.7 ± 7.9
Professional status:	
Registered nurse*	92 (67.6)
Assistant nurse†	44 (32.4)
Years since graduation	14.9 ± 8.7
Years of experience as a nurse	12.3 ± 8.5
Work experience in emergency unit:	
Yes	58.6 (24.0)
No	47.8 (26.0)
Work experience in coronary care unit:	
Yes	60.2 (22.5)
No	49.3 (26.1)
Years since first CPR course	12.6 ± 7.7
CPR refresher course after first course:	
Yes	73 (53.7)
No	63 (46.3)
CPR refresher course during last 6 months:	
Yes	18 (13.2)
No	18 (86.8)
Number of times performed CPR	5.9 ± 8.5
Willingness to attend new CPR training course	125 (91.9)

Values are n (%) or mean ± standard deviation. \*University or technological institution diploma; †high school diploma only. CPR – cardiopulmonary resuscitation.

**Table 2.** Performance in the written test.

Correct answers	n (%)
0	7 (5.1)
1	7 (5.1)
2	23 (16.9)
3	19 (14.0)
4	19 (14.0)
5	24 (17.6)
6	20 (14.7)
7	12 (8.8)
8	5 (3.7)

**Table 3.** Results for each of the eight questions.

Question	Correct answers (%)
1 What is the correct sequence of actions during BLS performance on an adult victim with one rescuer?	52 (38.2)
2 How can you check the victims' responsiveness?	82 (60.3)
3 What is the primary action in order to keep the airway open?	79 (58.1)
4 What is the compression to ventilation ratio in an adult victim with one rescuer?	80 (58.8)
5 What is the compression to ventilation ratio in an adult victim with two rescuers?	38 (27.9)
6 What is the hand position for chest compressions in adult resuscitation?	65 (47.8)
7 How many centimeters do you have to move the chest when performing chest compressions in adult resuscitations?	77 (56.6)
8 What are the complications of CPR performance?	77 (56.6)

BLS – basic life support; CPR – cardiopulmonary resuscitation.

as an intra-arrest factor that is associated with a higher percentage of patient survival.<sup>14</sup> Good theoretical knowledge is a prerequisite for nursing staff to provide high quality and effective CPR. The present study revealed that the nursing staff surveyed had unsatisfactory knowledge, since their mean score in the written test was 50.6 ± 25.9% and the mean number of correct answers was 4.1 ± 2. This finding is consistent with the findings of Zaharopoulos and colleagues.<sup>15</sup> The low level of theoretical knowledge can be partly explained by the fact that only 13.2% of the respondents had participated in a CPR training course during the last 6 months prior to the survey. Although the nursing staff take part in training programs during their career, very few refresh and update their knowledge and skills on the subject.<sup>16</sup> Studies have shown that participation in training courses once every six months contributes to retention of both theoretical knowledge and performance skills.<sup>5,17,18</sup> These highlight the need for continuous training.

A significant correlation was found between educational level and results in the written test, where registered nurses with higher education achieved higher scores than assistant nurses. Several studies have shown that patients in hospitals that have a greater percentages of nurses with higher education experience lower mortality and complication rates.<sup>19-21</sup>

The vast majority (91.9%) of respondents expressed their willingness to take part in ongoing CPR courses. This finding is consistent with another study undertaken in Greece.<sup>12</sup> According to Greek legislation, CPR training is compulsory for all healthcare professionals, and hospital administrators are obliged to grant them the necessary leave to participate in such training courses. A well-trained nursing

**Table 4.** Bivariate correlation analysis on demographics and answers in written test.

Characteristic	Correct answers	p-value
Educational level:		<0.001*
University	70.8 ± 7.2	
Technological Institute	57.0 ± 24.9	
High school	36.1 ± 22.3	
Work experience in emergency unit:		0.03 <sup>†</sup>
Yes	58.6 ± 24.0	
No	47.8 ± 26.0	
Years of experience as a nurse	-0.14 <sup>‡</sup>	0.10 <sup>§</sup>
Work experience in coronary care unit:		0.10 <sup>†</sup>
Yes	60.2 ± 22.5	
No	49.3 ± 26.1	
Number of times performed CPR	0.12 <sup>‡</sup>	0.17 <sup>§</sup>
Years since first CPR course	-0.29 <sup>‡</sup>	0.001 <sup>§</sup>
CPR refresher course after first course:		0.19 <sup>†</sup>
Yes	53.3 ± 25.9	
No	47.4 ± 25.6	

Data values are mean ± standard deviation. \*Analysis of variance, <sup>†</sup>t-test, <sup>‡</sup>Spearman's correlation coefficient, <sup>§</sup>Pearson's correlation coefficient.

staff may even evaluate an unconscious patient and consequently begin early CPR until the arrival of a response team, which may improve patient (survival) and hospital (mortality rate) outcomes.<sup>8</sup>

The findings from the present study and from others mentioned above indicate the need for good training that will enhance the knowledge level of nurses and consequently the in-hospital health outcomes through more effective care. Nevertheless, it should be mentioned that, whilst the sample of the survey was quite large, it came exclusively from a single hospital and therefore the study needs to be viewed in that light. A larger nationwide survey may be needed to ascertain whether the findings reported here hold true for all other hospitals, although this might reasonably be expected to be the case.

## Conclusion

Education and CPR training are provided to nurses during their undergraduate studies; therefore, frequent refresher courses are crucial for keeping them up to date with an intervention that, if properly delivered, may be crucially beneficial for patients in certain circumstances. In this light, the increasing incidence of cardiopulmonary diseases makes continuing CPR training imperative for nursing staff. If health-care organizations wish to ensure and improve the provision of safe and high-quality health services, they must provide constantly for the competence of the nursing staff, amongst other means by proper and

continuous CPR courses. The present study indicates that there is such a need in the case of a public hospital in Greece and perhaps for many others. This finding should be taken into consideration by health care managers and policy makers in their business planning.

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