ABSTRACT

background: Training in cardiopulmonary resuscitation (CPR) and automated external defibrillation (AED) remain important for nursing students, as the nurses should become active members of the health team during CPR and AED by increasing their knowledge and improving their skills. Aim: This study aimed to investigate the impact of Cardio5 Pulmonary Resuscitation / Defibrillation program on knowledge and performance of nursing students at College of Nursing, Najran University. Material and methods: The study sample consisted of nursing students from level 5 (group 1) who had no previous experience in CPR and AED and level 6 (group 2) who had a previous experience in CPR only. Data of the present study collected through utilizing 2 tools; tool (1) involved knowledge test questionnaire and tool (2) included performance checklist. Results: Results revealed significant statistical difference between group (1) and group (2) in their pre-program CPR performance. There was advancement in knowledge and performance of both groups regarding CPR&AED post implementation of the program and the retention of knowledge after four months from the program still high but there were no significant statistical differences between them regarding their knowledge and performance post program as well as 4 months later. Conclusion: The CPR/AED program succeeded to improve knowledge and performance of both groups.

INTRODUCTION

Cardiovascular disease is the leading cause of death over the worldwide. Most people with a heart attack die before reaching a hospital. In order to save the lives of cardiac emergency victims the first aid must be immediately available (Krittayaphong et al., 2009). During the recent years, Cardiopulmonary resuscitation (CPR) has received much attention. Varies international and national studies accepted guidelines for CPR have been published, and formal training program based on these guidelines are been conducted by certified training centers (Jacobs et al., 2004). The aim of these training courses is to impart of cognitive knowledge and psychomotor skills of CPR and to provide standardized care to cardiac arrest victim in
Cardiopulmonary resuscitation (CPR) is an emergency procedure which is performed in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person of cardiac arrest (Peberdy et al., 2003). In essence, Cardio (heart), Pulmonary (lung), Resuscitation (revive, revitalize). Acts as an artificial heartbeat and an artificial respirator. It indicated in those who are unresponsive with no breathing or abnormal breathing, for example agonal respirations. It may performed both in and outside of a hospital (Rudiger et al., 2004 & Ehlenbach et al., 2009).

CPR used on people in cardiac arrest in order to oxygenate the blood and maintain a cardiac output to keep vital organs alive. Blood circulation and oxygenation are required to transport oxygen to the tissues, John (2010). The brain may sustain damage after blood flow has stopped for about four minutes and irreversible damage after about seven minutes. Typically if blood flow ceases for one to two hours, the cells of the body die. Because of that, CPR is generally only effective if performed within seven minutes of the stoppage of blood flow, (Quan et al., 2001 & Madden, 2006). Recent statistics suggest that a healthy human brain may survive without oxygen for up to 4 minutes without suffering any permanent damage (Preusch et al., 2010). CPR may not save the victim even when performed properly, but if started within 4 minutes of cardiac arrest and defibrillation is provided within 10 minutes, a person have a 40% chance of survival until emergency arrives (Hamilton, 2005).

In 2010, the American Heart Association and International Liaison Committee on Resuscitation updated their CPR guidelines. The importance of high quality CPR (sufficient rate and depth without excessively ventilating) emphasized (Lupien, 2010). Universal compression to ventilation ratio of 30:2 recommended. The recommended order of interventions is chest compressions, airway, breathing or CAB in most situations, with a compression rate of at least 100 per minute in all groups (Rudiger et al., 2004 & Ranse, 2006).

CPR alone is unlikely to restart the heart; its main purpose is to restore partial flow of oxygenated blood to the brain and heart. The objective is to delay tissue death and to extend the brief window of opportunity for a successful resuscitation without permanent brain damage. So the studies have shown that immediate CPR followed by defibrillation within 3–5 minutes of sudden ventricular fibrillation (VF) or cardiac arrest improves survival (Hazinski, 2010).

An automated external defibrillator (AED) is a portable electronic device that automatically diagnoses the potentially life threatening cardiac arrhythmias of ventricular fibrillation and ventricular tachycardia in a patient and is able to treat them through defibrillation. The application of electrical therapy, which stops the arrhythmia, allowing the heart to reestablish an effective rhythm (Roppolo et al., 2007 & Bruce et al., 2009).

With recent advances in technology, automated external defibrillators
(AEDs) are now widely available, safe, effective, portable, and easy to use. They provide the critical and necessary treatment for sudden cardiac arrest (SCA) caused by ventricular fibrillation, the uncoordinated beating of the heart leading to collapse and death. Using AEDs as soon as possible after sudden cardiac arrest, within 3-4 minutes, can lead to a 60% survival rate. Three CPR is of value because it supports the circulation and ventilation of the victim until an electric shock delivered by an AED can restore the fibrillating heart to normal (Field et al., 2010). The American Heart Association, the American Red Cross, Federal Occupational Health and the National Center for Early Defibrillation provide additional information about AED program performing and development (Ranse, 2006). Rescuers play a vital role in life support so their knowledge and skills can mean the difference between life and death for many victims. It is up to the rescuer to recognize that emergency medical help needed, to begin first aid and contact the local emergency medical services (EMS) (Rudiger et al., 2004).

Nurses and nursing students must be able to respond correctly in the event of a cardiac arrest both inside and outside hospitals. Most nursing education institutions have resuscitation training within their curricula to meet these expectations and to ensure that students are competent at commencing life support in cases of cardiac arrest. In spite of this, previous studies in the nursing research literature have described poor retention of knowledge and skills in performing resuscitation (Bruce et al., 2009). Several educational methods of improving cardiopulmonary resuscitation (CPR) have tried out but both content and methods lack standardization (Passali et al., 2011). Nevertheless, simulation can used to meet these demands by creating learning opportunities that are unavailable in clinical practice, such as defibrillation and CPR (Krittayaphong et al., 2009).

**Significance of the Study:**

Despite the fact that quality of CPR has shown to correlate with improved patient outcomes, conventional training methods are often insufficient in enabling healthcare providers to deliver high-quality resuscitation care. Use of simulation methods during resuscitation training can increase subsequent resuscitation quality. Additionally, automated feedback during resuscitation has shown to improve CPR performance. Focused debriefing after resuscitation can improve CPR quality and increase initial resuscitation success (Field, et al., 2010).

Poor knowledge and skill retention following cardiopulmonary resuscitation training for nursing and medical staff has documented over the past 20 years. Cardiopulmonary resuscitation training is mandatory for nursing staff and is important as nurses often discover the victims of in-hospital cardiac arrest. Many different methods of improving this retention have devised and evaluated. However, the content and style of this training lack standardization (Cooper et al., 2007).

Finally, minimizing pauses in chest compressions by adopting cardio-cerebral resuscitation (CCR) protocols can lead to better patient survival. Implementing these measures on a more widespread basis can improve resuscitation care and ultimately
decrease patient mortality. The nurses must be able to respond quickly and effectively to cardiac arrest, numerous studies have demonstrated poor performance (Hazinski et al., 2010). So this study emphasized on the importance of CPR/AED training program for improvement of the nursing students' knowledge and skills.

**Aim of this study:**
This study aimed to investigate the impact of Cardio-Pulmonary Resuscitation / Defibrillation program on knowledge and performance of nursing students at College of Nursing, Najran University.

**Methodology:**

**Study design:**
A quasi-experimental design utilized in this study.

**Study Setting:**
This study conducted in Nursing College, at Najran University.

**Research hypothesis:**
1. After implementation of CPR/AED training program, nursing students will score higher in their knowledge than before implementation of program
2. After implementation of CPR/AED training program, nursing students will score higher in their performance than before implementation of program.

**Sample:**
The study sample consisted of nursing students from level 5 (group 1) who had no previous experience in CPR and AED and level 6 (group 2) who had a previous experience in CPR only. The total subjects were 20 students' nursing, who divided into 10 students from level (5) & 10 students from level (6) as a convenience sample.

**Tools:**
Data of the present study collected through utilizing the following two tools:

**First tool:** knowledge test questionnaire that developed by the researchers based on literature review (Madden, 2006 & Cooper et al., 2007) to assess nursing student knowledge regarding CPR/AED. It included (15) questions related to CPR and (8) questions related to AED.

The scoring system was (1) mark for each question and the total score was 23 marks for all questions.

**Second tool:** Performance check-list that was used to assess the nursing students' performance regarding CPR/AED that was developed by (Whitfield et al., 2003, Handley et al., 2005, Nolan et al., 2005 & Cooper et al., 2007). It was divided into (29) items related to CPR and (15) items related to AED, which divided as followed:

1. First category of performance check list related to CPR scales as the following: responsiveness/help (3) items; open air way (3) items; performance of breathing/ventilation (5) items; check for circulation/pulse (3) items; performance of chest compressions which divided into (5) items related to apply nurse hand position; (6) items related to do 30 compressions and reassessment which included (4) items.
2. Second category of performance checklist related to AED scales as the following: (analysis (7) items; delivering of shock (5) items and reassessment (3) items.

The scoring system was three points scale as the following: done (2), incompletely done (1) and not done (0). The total score for CPR was 58 and 30 for AED.

Content validity:

Both tools were handed to 5 experts from medical surgical nursing departments at different Universities to assess its clarity and based on their recommendations the necessary modifications were done.

Tools reliability:

Rater agreement for assessment of the CPR/AED checklist was 0.88

Procedure:

Prior to data collection, an official permission obtained from the College of Nursing Dean. This intended to explain the purpose of the study and to facilitate data collection. The researchers explained study purpose and procedures to all participants.

A pre-knowledge test questionnaire handed to all students (20) to test their knowledge about CPR & AED. As well as pre-performance checklist utilized by the researchers to observe students' performance regarding CPR & AED. The training program sessions held three times per week for 2 weeks to each group. Each session lasted about 2 hours and the total educational sessions for the program to each group were 6 sessions. The contents of program sessions were as the following: CPR knowledge (session1), CPR demonstration (session 2), CPR re-demonstration (session3), AED knowledge (session4), AED demonstration (session 5) and AED re-demonstration (session 6). The researchers utilized the following instructional media and materials as follow: power point presentation, video tape film, hand out for theoretical content (in class) and AED machine & CPR manikin for demonstration and re-demonstration (in lab.)

To investigate the impact of CPR&AED training program on nursing students' knowledge, the same knowledge test questionnaire handed to students immediately after implementation of program and 4 months later (follow up). As well as the researchers utilized the same performance check list to observe students' performance regarding CPR&AED immediately after implementation of program and 4 months later. Data collection period consumed 6 months.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 15. Number, mean, and standard deviation were calculated. For comparison between independent samples, the Mann-Whitney Test and ANCOVA were calculated. Significance was adopted at p<0.05 for interpretation of results of tests of significance.

RESULTS

Differences between the two groups regarding their CPR knowledge demonstrated by table (1) which showed that there was no significant statistical difference between group (1) and group

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(2) related to their preprogram CPR knowledge ($p=0.515$) favoring group (2) as well as their post program of CPR knowledge ($p=0.414$) and four months later ($p=0.262$). Difference between the two groups regarding their AED knowledge demonstrated by table (2) which explained that there was no significant statistical difference between group (1) and group (2) related to their preprogram AED knowledge ($p=0.665$) favoring group (2), their post program AED knowledge ($p=0.968$) and four months after the program ($p=0.693$). Difference between the two groups regarding their total CPR and AED knowledge showed by table (3) which revealed that, mean score of total CPR & AED knowledge preprogram implementation among group (2) ($11.2000\pm1.03280$) was higher than group (1) ($10.8000\pm3.08401$). Mean score of total CPR & AED knowledge post-program implementation among group (1) ($18.0000\pm2.40370$) was higher than group (2) ($17.2000\pm1.22927$). In addition, the mean score of total knowledge of CPR and AED after four months from program implementation among group (1) was 16.5000±2.41523. There was no significant statistical difference approved between both groups regarding their total knowledge during different periods of program implementation.

Difference between the two groups regarding their CPR performance demonstrated by table (4) which showed that, there was significant statistical difference between group (1) and group (2) related to their preprogram CPR performance ($p=0.016$). While there was no significant statistical difference between group (1) and group (2) related to their post program performance of CPR ($p=0.530$) as well as after four months from the program ($p=0.712$). Difference between the two groups regarding their AED performance exhibited by table (5) which explained that there was no significant statistical difference between group (1) and group (2) related to their preprogram performance of AED ($p=0.317$), as well as post program performance of AED ($p=0.519$) and after four months from the implementation ($p=0.677$). Difference between the two groups regarding their total CPR and AED performance showed by table (6) which exhibited that, mean score of total CPR&AED performance preprogram implementation among group (2) ($23.8000\pm4.75628$) was higher than mean score among group (1) ($19.2000\pm4.61399$). Mean score of total CPR&AED performance post-program implementation among group (2) ($99.0000\pm9.95546$) was higher than group (1) ($96.1000\pm8.17109$). In addition, mean score of total performance of CPR and AED after 4 months from program implementation among group (2) was 99.8000±12.18195 higher than group (1) (95.7000±8.36726). It is obvious from the same table that there was a statistical significant difference between group (1), and group (2) related to their pre-program total performance of CPD&AED ($p=0.025$), while there was no significant statistical differences between the two groups regarding to their CPR&AED performance post program and four months later.

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Table (1) Difference between the two groups regarding their CPR knowledge

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>F/Z</th>
<th>P</th>
</tr>
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</tr>
<tr>
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<td>13.90</td>
<td>1.96</td>
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<td>13.30</td>
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</tr>
<tr>
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Table (2) Difference between the two groups regarding their AED knowledge

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<th>F/Z</th>
<th>P</th>
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</thead>
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<td>3.80</td>
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</table>

Table (3) Difference between the two groups regarding their total CPR&AED knowledge

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<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>F/Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>11.2000</td>
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<tr>
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<tr>
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<td>2.00</td>
<td>10</td>
<td>17.2000</td>
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<td></td>
</tr>
<tr>
<td>Foll-total</td>
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<td>17.5000</td>
<td>2.54951</td>
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<tr>
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<td>10</td>
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<td>2.41523</td>
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Table (4) Difference between the two groups regarding their CPR performance

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<th>Mean</th>
<th>SD</th>
<th>F/Z</th>
<th>P</th>
</tr>
</thead>
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<tr>
<td>Foll- CPR</td>
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<td>74.4</td>
<td>7.56</td>
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</table>

*significant at 0.05 level
**significant at 0.01 level

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DISCUSSION

Regarding pre-program knowledge and performance of CPR and AED, the current study revealed significant statistical differences pre-program CPR performances between two study groups, as group 2 (the previously trained group) had a higher level of performance than group 1 (which had no previous training) \( (p=0.016) \). While there, was no significant statistical differences between group 1 and group 2 in CPR knowledge \( (p=0.515) \). From the researcher point of view the theoretical knowledge can easily forgotten than practical skills. In this regard, Hemming et al. (2003) showed that in many critical situations, staff personnel (medical doctors or registered nurses etc) do not have sufficient basic CPR knowledge with time. Research study done by Handley et al. (2003) showed that CPR knowledge and psychomotor skills are difficult to retain. Since previous studies have found that university students showed poor theoretical knowledge and demonstrated willingness and motivation for courses on basic life support (BLS) (Parnell et al., 2006 & Parnell and Larsen, 2007). While another research conducted by Madden (2006) demonstrated that, CPR knowledge retained more than CPR practical psychomotor skills. The study of Passali et al. (2011) demonstrated that nurses and doctors working in Greece have knowledge gaps in current BLS and

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>F/Z</th>
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<td>Post- AED</td>
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<td></td>
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Table (6): Difference between the two groups regarding their total CPR&AED performance

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<th>Mean</th>
<th>SD</th>
<th>F/Z</th>
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</tr>
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<td></td>
</tr>
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<td>99.800</td>
<td>12.18195</td>
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*significant at 0.05 level  
**significant at 0.01 level

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advanced life support (ALS) guidelines. While the study of Cooper, et al. (2007) that compared knowledge and performance related to immediate life support program among the focus group (without previous training) and the professional group, which had a previous basic life support training. Their study noted that for Immediate Life Support (ILS) candidates the mean pre-course test score (69.7%) was significantly higher (t=3.28, p=0.002) than for the group that previously participate in Basic Life Support (BLS) course. The difference may be attributable to knowledge gained from the pre-course manual. In addition this study exhibited, no significant statistical difference between group (1) and group (2) regarding pre-program AED knowledge (p=0.665) and performance (p=0.317). These results related to similarity between the two groups in previous experience since both groups did not participate in any prior AED training. Results of this study agreed by Papadimitriou et al. (2010) who found no significant statistical difference between the group who received AED manual before training and the other group in initial knowledge and performance before AED course.

Results of the current study exhibited advancement in CPR knowledge of nursing students in both groups as compared with their pre-program knowledge, favoring group (1). Moreover, there was no significant statistical difference between group (1) and group (2) regarding their CPR knowledge post program (p= 0.414) and four months later (p=0.262) and knowledge level among both groups still high after four months. These results could related to the success of the program that enabled untrained group to progress and acquire knowledge level higher than previously trained one, after separation of experience variable by the use of ANCOVA test. These results were going in line with the study of Cooper, et al. (2007) who reported a significance increase in pre and post course knowledge results of the focused group (F=70.1, p<0.001). Also demonstrated a significant effect of professional group, that previously participate in basic life support course (F= 2.08, p<0.001) on knowledge score. There was a significant improvement in knowledge retention after 6 months (independent samples t test, t=2.75, p=0.008) in the group that received ILS training (80%) compared with the group that received BLS training (71%). Ackermann (2009) noted that human patient simulation training on CPR had a statistically significant effect on the acquisition of CPR knowledge and skills among undergraduate nursing students. In addition, the 3-months retention scores for the experimental group were also significantly higher than for the control group. The degree of CPR knowledge immediately after training indicated that the degree of knowledge immediately after re-test increased considerably. Another studies emphasized the increase of nurses’ knowledge after CPR training; Pottle & Brant (2000) and Passali et al. (2011) pointed out that resuscitation training had a positive effect on theoretical CPR knowledge. Moreover, another study (Dane et al., 2000) shows that the survival of patients cared for nurses who had attended ALS almost four times higher compared programs to those cared for nurses who had not
attended such programs. Moretti et al. (2002) added that the chance of success is twice as high if there is an individual with ALS training in the team. On the other hand, the study of Olivetto de Almeida et al. (2011) found no differences in the scores obtained concerning theoretical knowledge of those who attended (n = 4) and who did not attend an ALS training program (p = 0.146). The same results reported by Lešnik et al. (2011) who observed equal levels of knowledge between the group with BLS training in high school and the group without any formal BLS education. While, Hatzakis et al. (2005) concluded that in Group A (previously trained group), 95% answered properly about the definition of Cardiopulmonary Rehabilitation (CPR) but only 25% were acquainted with the necessary number of chest compressions and 32.5% with the number of necessary mouth to-mouth ventilations to practice in case of CPR. In Group B (had no previous training), the corresponding percentages were 72.4%, 26% and 36.7%. Another study (Filgueiras et al., 2006) indicated that the score of emergency physicians who attended an ALS program was 14.9 while the score of those who did not was 10.5. These results are similar to those found in another study (Ribeiro et al., 2004) where the group with BLS presented improved performance. Moreover, Madden (2006) reported deterioration in CPR knowledge 10 weeks following CPR training.

First responders using automated external defibrillator voice prompts provide CPR less than half the time that the automated external defibrillator connected to the patient. Technical improvements in automated external defibrillator rhythm analysis, more efficient resuscitation algorithms, and first-responder education could increase CPR delivery and, perhaps improve outcome (van Alem et al., 2003). There are several studies showed the simplicity of operating automated external defibrillation, but due to lack of education which the main obstacle to impede access to defibrillation program (Taniguchi et al., 2008). Results of this study revealed progress in AED knowledge of nursing students in both groups as compared with their pre-program knowledge, favoring group (1). Moreover, there was no significant statistical difference between group (1) and group (2) regarding their AED knowledge post program (p = 0.968) and four months later (p = 0.693), moreover level of knowledge of the two groups still high after four months from the program, as the two groups of this study had no prior knowledge in AED. These results agreed by Kelley et al. (2006) who pointed out that subjects showed improvement in written knowledge regarding AED use as shown by scores on a written exam (60.9% versus 77.3%; p < 0.001). In the study of Reder et al. (2006), two days after training, all instructional groups had mean AED knowledge scores above 75%. After two months, AED scores were high, (89 to 100%) in all three training groups. Moreover, the study of Farah et al. (2007) noted that improvement found in the results of the drills held from 2003-2005, mainly in the medical departments as compared with the surgical departments and ambulatory clinics. The average score in 2005 was 77.2 (p = 0.001), compared with 74 (p = 0.012) in 2004, and 59 (p < 0.001) in 2003.
Improved criteria included: calling the doctor, staff work, CPR knowledge, and defibrillator (p < 0.05). While Papadimitriou et al. (2010) found no significant statistical difference between the group who received AED manual and the other group in acquisition of AED at 1, 3 and 6 months after initial training. In addition, the study of Semeraro et al. (2006) compared results of the advanced life support course, and noted that the percent of correct answers to the multiple choice question test decreased from 85.89 +/- 5.28% to 79.45 +/- 6.62% (P < 0.001) after 6 months.

Regarding the Differences in CPR performance between group (1) and group (2), this study found observable advancement in nursing students' CPR performance post program in comparison to pre-program implementation. In addition, there was no significant statistical difference between group (1) and group (2) related to their CPR performance post program (P = 0.530) and after four months (P =0.712), moreover after four months from the program, the two study groups still had elevated level of performance. These findings could refer to the success of the program that empowered untrained group to progress and obtain skills level similar to the previously trained one, after separation of experience variable by the use of ANCOVA test. These results are consistent with Williamson et al. (2005) who revealed that CPR performance among participants was significantly better after training, than before training. The same results reported by Bjørshol et al. (2009) who found advancement in the participants' level of performance post program. In the study of Lynch et al. (2005) which performed to assess the effectiveness of a 30-min CPR self-instruction program for lay responders, video-based self-instruction (VSI) subjects tended to have better overall performance and better ventilation performance than did Heart saver subjects. The study of Riegel et al. (2006) concluded that for global CPR performance, 79%, 73%, and 71% of volunteers tested for the first time since initial training three to five, six to 11, and 12 to 17 months after initial training, respectively. They judged by their instructors as having adequate performance (p < 0.001) and retention of skills. Isbye et al. (2007) conducted a study to compare BLS skill retention in adults with school children found that three months after a BLS course, adults had higher overall BLS skill retention scores than schoolchildren when using a simple personal resuscitation manikin. Castle et al. (2007), who performed a structured resuscitation-training program that has resulted in a noticeable improvement in BLS skills, particularly with regard to doctors. Registered nurses have improved with regular training compared with previously published data but health care assistants tend to perform poorly and are under-confident. While Nyman & Sihvonen (2000) conducted a study to describe the basic cardiac life-support (BLS) skills of nurses and nursing students in southern Finland and Hungary, showed that the best predictors for good response assessment skills went to those who were nursing students who had studied resuscitation skills sometime during the previous 6 months. The study of Cooper et al. (2007) reported that all participants of Immediate Life Support (ILS) course and BLS previously trained group, showed a significant improve-
ment in kills between the beginning and end of the course (p<0.001). The mean skills percentage score for the BLS trained control group was 58.7% compared to the 85.3 % retention level of the ILS group demonstrating a significant improvement in skills retention for the ILS trained group. A significant loss of skills 6 months after attending the ILS course, the ILS course still provided added value over a BLS course in terms of skills retention, (p=0.002). In addition, Ackermann (2009) who used a human patient simulation (HPS) cardiopulmonary arrest scenario for undergraduate nursing students, found a statistically significant effect on the acquisition of CPR skills. The 3-months retention scores for the experimental group were also significantly higher than for the control group. Moreover, the study of Lešnik et al. (2011) recognized that students with no training in BLS education have shown higher confidence in their own skills than students with BLS training from the driver's education course and have been more motivated for additional learning in the form of courses. On the other hand, the study of Hatzakis et al. (2005) that conducted on Industry Workers in Greece, noted that the vast majority of workers Trained group and untrained  group are unable to provide satisfactory CPR. There are several authors showed that CPR skill decreased with time. They demonstrated that retention ability of CPR skill in training was weak (Chamberlain et al., 2002; Palese et al., 2003; Woollard et al., 2004; Madden, 2006; and Timsit, 2006). In this regard, Einspruch et al. (2007) noted that adults between 40 and 70 years of age who participated in a CPR video self-instruction program experienced performance decline in their CPR skills after a post-training interval of 4 months. However, this decline was no greater than that seen in subjects who took Heart saver training.

For each minute that passes before defibrillation, the chance of survival reduced by about 10-12%. However, the nurses are hesitating in using automated external defibrillation to avoid harming the patients (Mäkinen et al., 2009). The current study showed improvement in nursing students AED performance post program compared to their performance pre-participation in the program. Moreover, there was no significant statistical differences between group (1) and group (2) in their AED performance post program (P = 0.519) and four months later (P = 0.677), favouring group (1), the two study groups attain the same level of skill performance after four months from the program. These results could related to effect of the program on both groups, as they had no previous training in AED. These results supported by Woollard et al. (2004) who noted that before AED training only 44% of subjects delivered a shock. Afterwards, all did so.The study of Riegel et al. (2006) which evaluated the retention of core CPR and AED skills among volunteer laypersons showed that for global AED performance, 91%, 86%, and 84% of volunteers tested for the first time since initial training three to five, six to 11, and 12 to 17 months after initial training, respectively. They judged as having adequate performance (p < 0.001) and retention of skills. In the study of Reder et al. (2006), after two days mean scores for key AED intervention were above 80% for all groups with training. After four months, mean scores were still high. The study of
Kelley et al. (2006) demonstrated that following initial training, 29/33 (87.8%) subjects demonstrated proficiency at AED application/operation in a mock adult cardiac arrest scenario. At four-weeks, 28/33 (84.8%) subjects demonstrated skill retention in similar scenario testing. In this respect, Woollard et al. (2006) noted that refresher classes held more frequently and at shorter intervals increased subjects' self-assessed confidence, possibly indicating greater preparedness to use an AED in a real emergency. The study of Roppolo et al. (2007) revealed that Performance following 30-min training was either equivalent or superior (p<0.007) to the multi-hour Heart saver-Automated External Defibrillator training in all measurements, both immediately and 6 months after training. Moreover, 93% continued to apply the automated external defibrillator and deliver shocks correctly. In addition, Källestedt et al. (2011) showed that 41% of the participants used AED before and 96% of the participants used AED after the intervention (P < 0.001). On the other hand, the study of Wik et al. (2003) revealed no difference between the group who attend the program and the other group who received written instructions in the process of AED charging and shock delivery. The study of Semeraro et al. (2006) concluded that after 6 months from advanced life support course, subsequent ALS interventions very delayed or forgotten, compared to skills at the end of the course. In addition, in the study of Andresen et al. (2008) all trainees tested immediately after the initial class in a standardized test scenario using an AED and a manikin. Either at 6 or at 12 months retests given. The 7-h training group showed a slightly higher rate of correct responses (7h: 96%, 4h: 94%, 2h: 92%) (p<0.001). Skill retention decreased significantly in the three groups. Moreover Papadimitriou et al. (2010) found no significant statistical difference between the group who received AED manual and the other group in acquisition of AED skills at 1, 3 and 6 months after initial training. Significant deterioration of AED skills observed in both groups between initial training and at 1 month after the course, as well as between the first and third month after the course.

The high rate of success:

In our training program can be use of CPR manikin and AED machine as well as the valuable materials that support the program performance (CPR/AED hand out, slide show, DVD and other equipment). Although other study advocates the use of video-based, self-training kits to reach a larger number of people and reduce costs (Isbye, et al., 2007). We favoured hands-on training within small groups led by skilled instructors, who can give individual feedback and advice. One of the main differences between nurse education and education of children in school is that nurse education based upon the theory and practice of adult learning. Furthermore, there are different teaching strategies (Quinn & Hughes, 2007). There is reason to believe that the program included repetitive practice, feedback and testing of CPR and AED knowledge and performance, as previously demonstrated by Oermann et al. (2011) and Sutton et al. (2011). Das & Elzubeir (2001) confirmed the importance of training physicians and other health care professionals...
in first aid and BLS in the form of formal training in the first year of medical school. In their study, they found that students were uniformly enthusiastic and highly motivated by the program. As happened in our study, nursing students liked the course and this strongly mirrored in the written comment given. Participants also valued the balance of lectures and practical activities. There was an extremely positive reaction to the quality of the lecturers. It was apparent from the written opinion that participants really enjoyed the course and more than anticipated, they were indebted for the training received.

CONCLUSION

The findings of this study specified the requirement for educating nursing students about cardio-pulmonary resuscitation and automated external defibrillation, because they will be members in the health team that provide immediate care for patients with cardiac arrest. The CPR/AED program that designed and implemented by the researchers succeeded to enhance CPR & AED knowledge and performance of nursing students for untrained group previously as well as for the trained group after separation of previous experience.

RECOMMENDATIONS

Conducting refresher training on regular intervals in CPR/AED for nursing students is important for better retention of their knowledge and skills. There is a need for Faculty of Nursing Staff to achieve a dynamic portion in improving scientific knowledge and practical skills of the nursing students away from their formal education by designing and implementing other educational programs in interesting topics and motivate students to participate in it.

REFERENCES


تأثير برنامج عن الإنعاش القلبي الرئوي والصدمة الكهربائية على معرفة وأداء طالبات التمريض

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الخلفية: يظل التدريب على الإنعاش القلبي الرئوي والصدمة الكهربائية مهم لطالبات التمريض، حيث ينبغي أن تصبح الممرضات عضوات فاعلة في الفريق الصحي أثناء القيام بالإنعاش القلبي الرئوي والصدمة الكهربائية الآلية من خلال زيادة معارفهم وتحسين مهاراتهن. الهدف: تهدف هذه الدراسة إلى استعراض أثر برنامج الإنعاش القلبي الرئوي والصدمة الكهربائية على معرفة وأداء طالبات التمريض بكلية التمريض-جامعة نجران. أدوات وطرق البحث: تألفت عينة الدراسة من طالبات التمريض في المستوى الخامس (المجموعة 1) الذين ليس لديهم خبرة سابقة في الإنعاش القلبي الرئوي والصدمة الكهربائية وطالبات المستوى السادس (المجموعة 2) الذين لديهم خبرة سابقة في الإنعاش القلبي الرئوي فقط. تم تجميع بيانات هذه الدراسة من خلال استخدام أدوات للبحث: الاداة الأولى وشملت أسئلة لاختبار المعرفة والأداء الثانية: وشملت قائمة تحقق الأداء. النتائج: كشفت النتائج عن وجود فروق ذات دلالة إحصائية بين المجموعة الأولى والمجموعة الثانية في أداءهما للإنعاش القلبي الرئوي قبل البرنامج. كان هناك تقدم في المعرفة والأداء من كلا المجموعتين بعد تنفيذ البرنامج حيث أن استباقه المعرفة بعد أربعة أشهر من البرنامج كانت لا تزال مرتفعة، مع العلم أنه لم يكن هناك فروق ذات دلالة إحصائية بينهما بشأن معرفتهم وأدائتهم بعد تنفيذ البرنامج وكذلك بعد أربعة أشهر منه. الخلاصة: نجح برنامج الإنعاش القلبي الرئوي والصدمة الكهربائية في تحسين المعرفة والأداء لكلا المجموعتين.

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