Factors Affecting Performance of Cardiopulmonary Resuscitation Team

[1]Asmaa Hamdi Mohamed, [2]Dalia Ali Ameen, [3]Mahmoud Adel Elhamamsy

[1]Assistant Professor of Medical Surgical Nursing, Faculty of Nursing- Ain Shams University-Cairo-Egypt.

[2]Assistant Professor of Medical Surgical Nursing, Faculty of Nursing-Ain Shams University-Cairo-Egypt.

[3]B.Sc. Nursing

Abstract

Background: There are many factors that affect quality of provided cardiopulmonary resuscitation, as it can improves return of spontaneous circulation and prevent sudden death**. Aim:** The present study was conducted to assess factors affecting performance of cardiopulmonary resuscitation team. **Research design:** A descriptive exploratory design. **Setting:** This study was conducted in Intensive Care Unit and Emergency Department of Wady El-Natroun Central Hospital**. Subject:** A convenient sample of all available nurses (N=55), and all available physicians (N=6). **Tools:** Three tools were developed (adapted) by the investigator to collect data and they were; cardiopulmonary resuscitation team knowledge assessment questionnaire, cardiopulmonary resuscitation quality assessment observational checklists and factors affecting cardiopulmonary resuscitation team performance checklists. **Result:** There was a statistical significant relationship between demographic characteristics (age of the studied subjects, education, years of experience and cardiopulmonary resuscitation training courses) regarding to total knowledge of the studied subjects, cardiopulmonary resuscitation teams' practice and factors affecting performance of cardiopulmonary resuscitation team. While there was a statistical significant relationship between total cardiopulmonary resuscitation teams' practice regarding to total knowledge of the studied subjects and factors affecting their performance.**Conclusion:** It was concluded that, several demographic factors were affecting the performance (age, years of experience, level of education and attendance of cardiopulmonary resuscitation courses), in addition to the organizational factors and personal factors. Also it was found that the knowledge level was affecting the performance. **Recommendations:** The study recommended the importance of implementing continuous training programs and recommended to obtain basic life support and advanced life support before practicing the profession.

Keywords: Factors affecting performance, Cardiopulmonary resuscitation and team**.**

Introduction

Sudden Cardiac Arrest (SCA) is the expected final outcome to many of critical diseases. It is the cessation of normal circulation of the blood to vital organs or any part of the body. Cardiac arrest can affect healthy individuals of any age, race, ethnicity, or gender at any time in any location, often silent without warning signs. The survival of SCA patients depends on several factors such as the integration of Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) in addition to post resuscitation care. **(Filho, Santos, Silva & Nogueira, 2015; Cook & LaPierre, 2014).**

Cardiopulmonary Resuscitation (CPR) cannot usually restart the heart, but it ensures delivery of oxygen mainly to the heart and brain. For each minute pass without resuscitation is being initiated; the probability of survival from SCA falls by 10–15%. Cardiopulmonary resuscitation is a rapid and urgent lifesaving intervention to prevent death or postpone it in a

patient with SCA **(Al-Janabi & Al-Ani, 2014 & Refaey, 2012).**

Many hospitals have a team of CPR. Cardiopulmonary resuscitation is carried out by trained, skillful, knowledgeable and active team with scientifically and practically qualified human resources who is called code blue team. This team is varying in size, composition, and roles and come from different areas of the hospital in response to the code that has been called **(Shahrakivahed et al., 2015).**

To ensure optimal performance of CPR, several crucial elements have been recognized and stressed as follow: human factors which include knowledge of the team, training and retraining of resuscitation team, role of skilled and updated team leader, technical skills and non-technical skills of teams. Also environmental factors which include optimal equipment and resources, policies and setting itself affect performance of CPR team **(Filho et al., 2015; Hunziker, Tschan, Semmer, & Marsch, 2013).**

Team coordination, task management, easy information flow, measurements of leadership with clearly defined resuscitation team leader as (clearly define roles and responsibilities of team members and supervising patient care), communication, decision making, situation awareness, cooperation, effective team performance and resources management, are considered essential for effective teamwork, improved task performance and increase in chance of survival among patients **(O'Donoghue et al., 2015; Castelao, Russo, Riethmüller & Boos, 2013).**

Nurses are the central part of the health care system and are backbones of any hospital. Nurses play a pivotal role in performing multi-faceted tasks throughout the CPR. Nurses are often the first health care professionals to identify a patient with SCA in the hospital setting and therefore they must respond quickly and effectively to SCA, having adequate competency to provide effective emergency life-saving resuscitation while waiting for the ACLS team to arrive and must receive mandatory

CPR training **(Rajeswaran, Cox, Moeng & Tsima, 2018; plagisou et al., 2015).**

Significance of the Study

The World Health Organization estimates that 17.7 million people died in 2015 from cardiopulmonary diseases mainly because of SCA, which are consequently classified as the leading causes of death and accounting for 45% of all Non-Communicable Diseases (NCDs) which reach to 40 million deaths. In Egypt during 2016, the number of total deaths was 608000. The burden of NCDs is causing 84.7% of all deaths while cardiovascular diseases account for 46.2% of NCDs. So, SCA is an important cause of cardiovascular morbidity and mortality in both developed and developing countries **(World Health Organization [WHO], 2016).**

Aim of the Study

The present study was conducted to assess the factors affecting performance of CPR team and this was achieved through the following: Assessment of knowledge of CPR team regarding CPR technique. Assessment of CPR technique performance among CPR team. Assessment of the factors affecting CPR team performance.

Research Questions

This study was conducted to answer the following research question: What are the factors affecting performance of CPR team?

Subjects and Methods

The subjects and methods for this study were portrayed under the four main designs as the following:

I-Technical design:

The technical design includes research design, setting, subjects and tools for data collection used in the study.

Research design:

A descriptive exploratory research design was used to achieve the aim of this study.

Research setting:

This study was conducted in the Intensive Care Unit and Emergency Department of Wady El-Natroun Central Hospital at Behira Governorate.

Subjects:

A convenient sample of all available staff performing CPR and they were 61 subjects (55 nurses and 6 physicians).

Tools for data collection: Three tools were developed by the researcher (adapted) to collect data pertinent to this study, and they were:

I-Cardiopulmonary resuscitation team knowledge assessment questionnaire sheet:

A self-administered questionnaire was developed by the researcher in simple Arabic language to assess CPR teams' level of knowledge regarding CPR, it adapted from **(Meaney et al., 2013; National Cardiopulmonary Resuscitation Association, 2017; Nord, 2017 & Sehgal & Trikha, 2017).**

The questionnaire included two parts as the following:

Part 1: It was used to assess the CPR teams' demographic characteristics.

Part 2: It was used to assess CPR teams' level of knowledge regarding CPR and it was consisted of 50 MCQ.

II- Cardiopulmonary resuscitation quality assessment (CPR teams' practices) observational checklists:

It was developed by the researcher to assess CPR teams' practices regarding to CPR, it adapted from **(Australian Resuscitation Council, 2017; Berkowitz, 2014; Martin, 2018; Meaney et al., 2013; National Cardiopulmonary Resuscitation**

Association, 2017; National Health Services, 2017; Resuscitation Council United Kingdom, 2017 & Vafaei, Shams Akhtari, Heidari & Hosseini, 2018).It included two parts as the follow:

Part 1: It was conducted on 61 CPR teams, and it was consisted of checklist regarding total number of team members and presence of separate member for leading the team, chest compression, ventilation and breathing, medication administration, defibrillation and documentation.

Part 2: It was consisted of five sections of observational checklists about circulation maintenance and chest compression, airway opening, ventilation or breathing, defibrillation delivery and medication administration.

III- Factors affecting CPR team performance checklist:

It was developed by the researcher to assess factors affecting CPR team performance, it adapted from **(Australian Resuscitation Council, 2017; Berkowitz, 2014; Hunziker et al., 2013; Martin, 2018; Meaney et al., 2013; National Cardiopulmonary Resuscitation Association, 2017; National Health Services, 2017 & Prince, Hines, Chyou & Heegeman, 2014)**. It included two parts as the follow:

Part (1): Personal related factors which divided into two sections as follow: team leader related factors (14steps) and team members related (18steps).

Part (2): Organizational factors which were divided into three sections as follow: policies related factors (seven steps), setting or structure related factors (five steps) and supplies related factors (21 steps).

II- Operational design:

The operational design includes preparatory phase, content validity, pilot study and field work.

Preparatory phase:

It included reviewing of related literatures, and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection.

Tools validity and reliability:

Testing validity of the proposed tools by inspecting the items to determine whether the tools measure what supposed to measure. The tools were revised by a jury of five experts from different academic categories (one professor, two assistant professors and two lecturers) from Medical Surgical Nursing Department, Faculty of Nursing-Ain Shams University. The experts reviewed the tools and its content for clarity, relevance, comprehensiveness, accurateness, logical consequence, applicability and simplicity. Modifications were done according to their recommendations. Testing reliability of the proposed tools was done statistically by Cronbach Alpha test. It was used to examine whether the questionnaire and checklists had an internal consistency.

Pilot study:

A pilot study was carried out on 10% of nurses (6 nurses) and 10% of CPR teams (6 teams) from the total study subjects to test the applicability, clarity, feasibility of the tools used in the study and to determine the time needed to answer the study tools. There were no modifications done after conducting pilot study.

Field work:

The researcher simply explain the aim or purpose of the study to the studied subjects and obtain their written permission for data collection prior to data collection. All the available subjects were included in the study. Data collection took about six months through four days per week at ICU and ER department of Wady El-Natroun Central Hospital. The researcher assessed study subjects' knowledge regarding CPR at Wady El-Natroun Central Hospital by using self-administered questionnaire and it took 15 to 30 minutes to be filled by the studied subjects. The observational checklists (11 checklists) were filled by the researcher in up-to 30 minutes through observing each member in the team during the time of CPR.

III- Administrative design:

An official letter was issued from the Faculty of Nursing Ain Shams University to the Medical and Nursing Director of Wady El-Natroun Central Hospital and explaining the purpose of the study.

A brief explanation of the study was given to the participants that the information obtained will be treated confidentially, used only for the purpose of the study, will not cause any harm to the participants and informed that their participation is voluntary. The participants were informed that they are allowed to choose whether to participate or withdraw from the study at any time.

Ethical considerations:

The ethical research considerations in this study included the following:

- The research approval was obtained from the Scientific Ethical Committee in Faculty of Nursing, Ain Shams University before starting the study.

- The researcher clarified the objective and aim of the study to the nurses and physicians included in the study before starting the study.

- The researcher assured maintaining anonymity and confidentiality of the subjects' data that were included in the study.

- Nurses and physicians were informed that they were allowed to choose to participate or not in the study and they had the right to withdraw from the study at any time without any reason.

- Written consent was obtained from nurses to participate in the study.

IV- Statistical Design:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric. Also qualitative variables were presented as number and percentages.

Crohnbach Alpha test was used to assess the internal reliability and consistency of the studied questionnaire. The comparison between groups regarding qualitative data was done by using Chi-square test The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

- P > 0.05: Non significant (NS)

- P < 0.05: Significant (S)

Results

Table (1): illustrates that, 44.3% of the studied subjects had average level of knowledge about cardiac arrest, 47.5% of the studied subjects had average level of knowledge about CPR, 57.4% of them had average level of knowledge about actions required before starting CPR and 52.5% of them had good level of knowledge about airway opening. Also the same table reveals that, 55.7% of the studied subjects had good level of knowledge about breathing, 41.0% of them had poor level of knowledge about chest compression, 47.5% of them had poor level of knowledge about DC shock and 83.6% of the studied subjects had good level of knowledge about actions required after finishing CPR.

While 54.1% of the studied subjects had average level of knowledge about medications administration according to American protocol and 57.4% of the studied subjects had average level of total knowledge about CPR.

Table (2): reveals that, 45.9% of observed CPR teams had poor level of practice regarding circulation maintenance and chest compression, 57.4% of them had poor level of practice regarding airway opening and 63.9% of them had poor level of practice regarding breathing performance. The same table shows that, 41.0% of observed CPR teams had good level of practice regarding defibrillation delivery, 65.6% of observed CPR teams had poor level of practice regarding medication administration and 49.2% of the observed CPR teams' members had poor level of regarding total CPR practices.

Table (3): reveals that, factors affecting performance of CPR team were average by 65.6% of studied CPR teams and it was distributed as follow: Personal factors were divided into team leader related factors which were poor by 54.1% of studied CPR teams and team members related factors which were poor by 70.5% of studied CPR teams. While environmental factors were divided into policies related factors which were poor by 98.4% of studied CPR teams, setting/structure related factors which were average by 55.7% of studied CPR teams and supplies related factors which were good by 68.9% of studied CPR teams.

Table (4): reveals that, there was a statistical significant relationship between total knowledge of the studied subjects and age of the studied subjects, CPR training courses, education and their years of experience.

Table (5): revealed that, there was a statistical significant relationship between total CPR teams' practice and age of the studied subjects, years of experience, education and CPR training courses.

Table (6): reveals that, there was a statistical significant relationship between total factors affecting performance of CPR team and age of the studied subjects, sex, education, years of experience and CPR training courses.

Table (7): reveals that, there was a statistical significant relationship between total CPR teams' practice and total knowledge of the studied subjects

Table (8): reveals that, there was a statistical significant relationship between total number of CPR team members and circulation maintenance, chest compression, airway opening, defibrillation delivery and total CPR teams' practice.

Table (9): reveals that, there was a statistical significant relationship between CPR teams' practice and factors affecting performance of CPR team.

Table (1): Frequency and percentage distributions of the studied subjects' knowledge.

Assessment of CPR team knowledge about CPR	Poor		Average		Good	
	No.	%	No.	%	No.	%
Cardiac arrest	17	27.9%	27	44.3%	17	27.9%
Cardiopulmonary resuscitation	22	36.1%	29	47.5%	10	16.4%
Required actions before starting CPR	2	3.3%	35	57.4%	24	39.3%
Airway opening	10	16.4%	19	31.1%	32	52.5%
Breathing	5	8.2%	22	36.1%	34	55.7%
Chest compression	25	41.0%	11	18.0%	25	41.0%
DC shock	29	47.5%	15	24.6%	17	27.9%
Required actions after finishing CPR	10	16.4%	0	0.0%	51	83.6%
Medication according to American protocol	21	34.4%	33	54.1%	7	11.5%
Total knowledge	10	16.4%	35	57.4%	16	26.2%

Table (2): Frequency and percentage distribution of team's level of practice or CPR quality (n=61).

CPR team quality assessment observational checklist oer event	Poor		Average		Good	
	No.	%	No.	%	No.	%
Circulation maintenance and compression related assessment	28	45.9%	27	44.3%	6	9.8%
Airway opening related assessment	35	57.4%	21	34.4%	5	8.2%
Breathing performance related assessment	39	63.9%	19	31.1%	3	4.9%
Defibrillation delivery related assessment	24	39.3%	12	19.7%	25	41.0%
Medications administration related assessment	40	65.6%	17	27.9%	4	6.6%
Total CPR team quality assessment	30	49.2%	28	45.9%	3	4.9%

Table (3): Frequency and percentage distribution of factors affecting performance of CPR team (n=61).

Factors affecting performance of CPR team (Per event)			Poor		Average		Good	
			No.	%	No.	%	No.	%
Personal Factors		Team leader related factors.	33	54.1%	19	31.1%	9	14.8%
		Team members related factors.	43	70.5%	16	26.2%	2	3.3%
Environmental Factors		Policies-related factors.	60	98.4%	1	1.6%	0	0.0%
		Setting/structure-related factors.	2	3.3%	34	55.7%	25	41.0%
		Supplies related factors.	4	6.6%	15	24.6%	42	68.9%
Total factors affecting performance of CPR team			20	32.8%	40	65.6%	1	1.6%

Table (4): Relation between demographic characteristics of study subjects and their level of total knowledge about cardiopulmonary resuscitation (n=61).

Demographic characteristics		Total knowledge						Chi-square test	
		Poor		Average		Good		X^2	P-value
		No.	%	No.	%	No.	%		
Age	20- < 25 yrs	7	70.0%	4	11.4%	2	12.5%	20.673	*0.002
	25- < 30 yrs	3	30.0%	24	68.6%	9	56.3%		
	30- < 35 yrs	0	0.0%	5	14.3%	5	31.3%		
	35--≤ 40 yrs	0	0.0%	2	5.7%	0	0.0%		
Gender	Male	5	50.0%	18	51.4%	11	68.8%	1.495	0.474
	Female	5	50.0%	17	48.6%	5	31.3%		
marital status	Married	2	20.0%	16	45.7%	6	37.5%	6.985	0.322
	Single	7	70.0%	15	42.9%	10	62.5%		
	Widow	0	0.0%	3	8.6%	0	0.0%		
	Divorced	1	10.0%	1	2.9%	0	0.0%		
Occupation	ICU nurse	6	60.0%	16	45.7%	8	50.0%	5.074	0.750
	ER nurse	4	40.0%	16	45.7%	5	31.3%		
	ICU Physician	0	0.0%	2	5.7%	1	6.3%		
	ER Physician	0	0.0%	1	2.9%	1	6.3%		
	CCU Physician	0	0.0%	0	0.0%	1	6.3%		
Education	Diploma (nurses)	0	0.0%	5	14.3%	0	0.0%	14.512	*0.024
	Technical institute (nurses)	9	90.0%	13	37.1%	5	31.3%		
	Bachelor (nurses)	1	10.0%	14	40.0%	8	50.0%		
	Post graduate (physician)	0	0.0%	3	8.6%	3	18.8%		
Years of experience	1- < 5 yrs	9	90.0%	22	62.9%	7	43.8%	18.473	*0.0205
	5- < 10 yrs	1	10.0%	8	22.9%	8	50.0%		
	10- < 15 yrs	0	0.0%	4	11.4%	1	6.3%		
	15- ≤ 20 yrs	0	0.0%	1	2.9%	0	0.0%		
CPR training courses	No Courses	10	100.0%	27	77.1%	2	12.5%	34.929	*<0.001
	One Courses	0	0.0%	3	8.6%	6	37.5%		
	Two Courses	0	0.0%	2	5.7%	8	50.0%		
	Three Courses	0	0.0%	3	8.6%	0	0.0%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Table (5): Relation between demographic characteristics of the studied subjects and total CPR teams' practice (n=61).

Demographic characteristics		Total CPR team quality assessment						Chi-square test	
		Poor		Average		Good		X^2	P-value
		No.	%	No.	%	No.	%		
Age	20-<25 yrs	8	26.7%	5	17.9%	0	0.0%	43.846	*0.000
	25-<30 yrs	16	53.3%	20	71.4%	0	0.0%		
	30-<35 yrs	6	20.0%	3	10.7%	1	33.3%		
	35-≤40 yrs	0	0.0%	0	0.0%	2	66.7%		
Gender	Male	15	50.0%	17	60.7%	2	66.7%	0.827	0.661
	Female	15	50.0%	11	39.3%	1	33.3%		
Marital status	Married	10	33.3%	12	42.9%	2	66.7%	3.657	0.723
	Single	16	53.3%	15	53.6%	1	33.3%		
	Widow	2	6.7%	1	3.6%	0	0.0%		
	Divorced	2	6.7%	0	0.0%	0	0.0%		
Occupation	ICU nurse	13	43.3%	16	57.1%	1	33.3%	4.770	0.782
	ER nurse	12	40.0%	11	39.3%	2	66.7%		
	ICU Physician	2	6.7%	1	3.6%	0	0.0%		
	ER Physician	2	6.7%	0	0.0%	0	0.0%		
	CCU Physician	1	3.3%	0	0.0%	0	0.0%		
Education	Diploma (nurses)	3	10.0%	2	7.1%	0	0.0%	15.287	*0.018
	Technical institute (nurses)	13	43.3%	14	50.0%	0	0.0%		
	Bachelor (nurses)	10	33.3%	12	42.9%	1	33.3%		
	Post graduate (physician)	4	13.3%	0	0.0%	2	66.7%		
Years of experience	1-<5 yrs	22	73.3%	16	57.2%	0	0.0%	41.279	*0.000
	5-<10 yrs	5	16.7%	12	42.8%	0	0.0%		
	10-<15 yrs	3	10.0%	0	0.0%	2	66.7%		
	15-≤20 yrs	0	0.0%	0	0.0%	1	33.3%		
CPR training courses	No Courses	18	60.0%	21	75.0%	0	0.0%	13.164	*0.041
	One Courses	5	16.7%	3	10.7%	1	33.3%		
	Two Courses	7	23.3%	2	7.1%	1	33.3%		
	Three Courses	0	0.0%	2	7.1%	1	33.3%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Table (6): Relation between demographic characteristics of studied subjects and factors affecting performance of CPR team (n=61).

Demographic characteristics		Factors affecting performance of CPR team						Chi-square test	
		Poor		Average		Good		X^2	P-value
		No.	%	No.	%	No.	%		
Age	20-<25 yrs	3	15.0%	10	25.0%	0	0.0%	34.252	*0.000
	25-<30 yrs	11	55.0%	25	62.5%	0	0.0%		
	30-<35 yrs	6	30.0%	4	10.0%	0	0.0%		
	35-≤40 yrs	0	0.0%	1	2.5%	1	00.0%		
Gender	Male	16	80.0%	18	45.0%	0	0.0%	7.901	*0.019
	Female	4	20.0%	22	55.0%	1	100.0%		
marital status	Married	9	45.0%	14	35.0%	1	100.0%	2.558	0.862
	Single	9	45.0%	23	57.5%	0	0.0%		
	Widow	1	5.0%	2	5.0%	0	0.0%		
	Divorced	1	5.0%	1	2.5%	0	0.0%		
Occuaption	ICU nurse	7	35.0%	23	57.5%	0	0.0%	15.220	0.055
	ER nurse	7	35.0%	17	42.5%	1	100.0%		
	ICU Physician	3	15.0%	0	0.0%	0	0.0%		
	ER Physician	2	0.0%)	0	0.0%	0	0.0%		
	CCU Physician	1	5.0%	0	0.0%	0	0.0%		
Education	Diploma (nurses)	0	0.0%	5	12.5%	0	0.0%	19.685	*0.003
	Technical institute (nurses)	5	25.0%	22	55.0%	0	0.0%		
	Bachelor (nurses)	9	45.0%	13	32.5%	1	100.0%		
	Post graduate (physician)	6	30.0%	0	0.0%	0	0.0%		
Years of experience	1- < 5 yrs	16	80.0%	22	55.0%	0	0.0%	64.658	*0.000
	5- < 10 yrs	3	15.0%	14	35.0%	0	0.0%		
	10- < 15 yrs	1	5.0%	4	10.0%	0	0.0%		
	15- ≤ 20 yrs	0	0.0%	0	0.0%	1	100.0%		
CPR training courses	No Courses	10	50.0%	29	72.5%	0	0.0%	22.660	*0.001
	One Courses	4	20.0%	5	12.5%	0	0.0%		
	Two Courses	5	25.0%	5	12.5%	0	0.0%		
	Three Courses	1	5.0%	1	2.5%	1	100.0%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Table (7): Relation between total CPR teams' practice and total knowledge of the studied subjects (n=61).

Total CPR team quality assessment	Total knowledge						Chi-square test	
	Poor		Average		Good		X^2	P-value
	No.	%	No.	%	No.	%		
Poor	5	50.0%	17	47.6%	8	50.0%		
Average	5	50.0%	18	51.4%	5	31.3%	9.461	*0.042
Good	0	0.0%	0	0.0%	3	18.8%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Table (8): Relation between total number of CPR team and their practices (n=61).

CPR quality or their practices		Total number 4		Total number 5		Total number 6		Chi-square test	
		No.	%	No.	%	No.	%	X^2	P-value
Circulation maintenance or compression related assessment	Poor	22	73.3%	6	26.1%	0	0.0%		
	Average	6	20.0%	17	73.9%	4	50.0%	34.864	*0.000
	Good	2	6.7%	0	0.0%	4	50.0%		
Airway opening related assessment	Poor	22	73.3%	12	52.2%	1	12.5%		
	Average	6	20.0%	10	43.5%	5	62.5%	11.697	*0.020
	Good	2	6.7%	1	4.3%	2	25.0%		
Breathing performance related assessment	Poor	21	70.0%	15	65.2%	3	37.5%		
	Average	8	26.7%	7	30.4%	4	50.0%	3.266	0.514
	Good	1	3.3%	1	4.3%	1	12.5%		
Defibrillation delivery related assessment	Poor	17	56.7%	7	30.4%	0	0.0%		
	Average	4	13.3%	8	34.8%	0	0.0%	18.653	*0.001
	Good	9	30.0%	8	34.8%	8	100.0%		
Medications administration related assessment	Poor	24	80.0%	13	56.5%	3	37.5%		
	Average	5	16.7%	8	34.8%	4	50.0%	6.419	0.170
	Good	1	3.3%	2	8.7%	1	12.5%		
Total CPR team quality assessment	Poor	23	76.7%	7	30.4%	0	0.0%		
	Average	6	20.0%	16	69.6%	6	75.0%	26.697	*0.000
	Good	1	3.3%	0	0.0%	2	25.0%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Table (9): Relation between practice and factors affecting team's performance**.**

Total Score of factors	Total CPR team quality assessment						Chi-square test	
	Poor		Average		Good		X^2	P-value
	No.	%	No.	%	No.	%		
Poor	14	46.7%	6	21.4%	0	0.0%		
Average	16	53.3%	22	78.6%	2	66.7%	24.589	*< 0.001
Good	0	0.0%	0	0.0%	1	33.3%		

* P-value < 0.05 was considered significant X^2:Chi-square test

Discussion

The current study sought to establish the baseline level of knowledge and practices regarding cardiopulmonary resuscitation and to assess factors affecting performance of CPR team in ICU and ER of Wady El Natroun Central Hospital.

Studied subjects' knowledge regarding CPR

Regarding airway opening, this study illustrated that about half of the studied subjects had good knowledge about airway opening and had poor knowledge about defibrillation. This finding was not in the same line with **Lima, Macedo, Vidal & Sá, (2009)** who found that, about one third of the studied subjects had poor knowledge about airway opening and also found that, more than one third of the studied subjects had poor knowledge about DC shock.

Regarding chest compression, this study showed that more than one third of the studied subjects had poor knowledge about chest compression. This finding was in the same line with **Zacharopoulos, Pretorrent & Merkouris, (2007)** who conducted a study about "assessment of nurses' knowledge on basic cardio pulmonary resuscitation (B-CPR)" and found that, the vast majority of the studied subjects had low level of knowledge about breathing.

Concerning the total knowledge of CPR, the current study revealed that more than half of the studied subjects had average level of knowledge about CPR. This finding was similar to **Ehlers & Rajeswaran, (2014)** who conducted a study about "CPR knowledge and skills of RN in Botswana" and found that, more than half of the studied subjects had average level of knowledge about CPR.

Cardiopulmonary resuscitation teams' level of practice

The current study revealed that about half of the studied CPR teams were poor in practicing circulation maintenance and chest compression. This finding was in the same line with **Ehlers & Rajeswaran, (2014)** who found that, no one passed and the chest compression skills were poor.

Regarding airway opening, the current study showed that more than half of the studied CPR teams were poor in practicing airway opening. This finding was in the same line with **Ehlers & Rajeswaran, (2014)** who found that, no one passed and airway opening skills were poor.

Regarding breathing performance, the current study showed that about two thirds of the studied CPR teams were poor in practicing breathing during CPR. This finding was in the same line with **Ehlers & Rajeswaran, (2014)** who found that, no one passed and the breathing skills were poor

According to medication administration, the current study illustrated that two thirds of the studied CPR teams were poor in practicing medication administration during CPR. This finding was in the same line with **El-Meanawi, (2015)** who found that, more than half of the studied subjects' skills about medication administration were unsatisfactory.

Concerning the total level of quality and practices of CPR teams, the current study illustrated that almost half of the studied CPR teams were poor in total CPR practices. This finding was in the same line with **Kaihula, Sawe, Runyon & Murray, (2018)** that conducted study about "assessment of CPR knowledge and skills among healthcare providers at an urban tertiary referral hospital in Tanzania" and found that, overall of the studied subjects' skills about CPR were poor.

Factors affecting performance of CPR team members

The current study revealed that more than half of team leaders were poor during their evaluation in leading the team during CPR. This finding was in the same line with **Marsch et al., (2004)** who conducted a study "about human factors affect the quality of cardiopulmonary resuscitation in simulated cardiac arrests" and found that, absence of leadership behavior and absence of explicit task distribution were associated with poor team performance.

While the current study revealed that more than two thirds of team members were poor during their evaluation in CPR. This finding was in the same line with **Marsch et al., (2004)** who found that, failure to translate theoretical knowledge into effective team activity appears to be a major problem.

The relation between demographic characteristics of the studied subjects regarding to their level of total knowledge,

CPR teams' practice and factors affecting their performance.

The current study showed that there was a statistical significance relationship between age of the studied subjects and their total knowledge about CPR. This finding was near to what demonstrated by **Jokari & Gorjian, (2017)** who conducted a study about "the effect of educational training on nurses' clinical function of cardiopulmonary resuscitation" and found that, there was a significant relationship between the total knowledge scores and age.

Also there was a statistical significance relationship between the years of experience of the studied subjects and their total knowledge about CPR. This result was similar to **Farg, (2015)** who conducted a study about "nurse's knowledge and performance regarding children with traumatic brain injury in trauma and ICU at Assiut University Hospital"_and found that, statistically significant relationship were illustrated between nurse's knowledge and their years of experience.

The current study showed that there was statistical significance relationship between the education of the studied subjects and their total knowledge about CPR. This finding was similar to **Farg, (2015)** who found that, statistical significance relationship were illustrated between nurse's knowledge and their level of education.

While there was a statistical significance relationship between the CPR training courses of the studied subjects and their total knowledge about CPR. This finding was in the same line with **Mohamed, Elbana & Elhaleim, (2017)** who found that, there was a statistical significance difference between total knowledge scores of maternity nurses and their previous training regarding CPR.

The study findings showed that, there was a statistical significance relation between

total CPR teams' practices regarding their age and years of experiences. These findings were in the same line with **Elsadee, (2017)** who found that, there was a statistically significant relation between the nurses' level of practice regarding their age and years of experience.

The current study revealed that, there was a statistical significance relation between total CPR teams' practices regarding to education and CPR training courses of the studied subjects**.** These findings were in the same line with **Elsadee, (2017)** who found that, there was a statistically significant relation between the CPR teams' level of practice regarding their CPR training courses and level of education.

While the study findings revealed that, there were a statistical significance relation between total factors affecting performance of CPR team members regarding their age, educational level, CPR courses and their years of experiences. Also there were statistical significance relation between total factors affecting performance of CPR team members and gender.

The relation between levels of total knowledge of the studied subjects regarding to their CPR teams' practice

The current study showed that, there was a statistical significance relation between total knowledge of the studied subjects and CPR teams' practice. This finding was similar to **Kelkay, Kassa, Birhanu & Amsalu, (2018)** who found that, there was a statistically significant relation between the nurses' level of practice and knowledge of the studied subjects.

The relation between total number of CPR team members regarding their level of practice and factors affecting performance of CPR team members.

The present study showed that, CPR performance was significantly improved with increasing in number of team members from four to five to six members. There was a statistical significance relationship between number of CPR team members regarding to airway opening, circulation maintenance or chest compression, defibrillation delivery and total CPR team quality or practices.

The findings of this study were in the same line with **Sefrin & Paulus, (1994)** who conducted a study about "resuscitation skills of hospital nursing staff" and found that, about three quartile of CPR team members were with four members and failed to perform effective CPR maneuvers.

While the current study revealed that, there was as a statistical significance relationship between numbers of CPR team members concerning to team leader related factors, team members' related factors and total factors affecting performance of CPR team.

The findings of this study were similar to **Filho et al., (2015)** who found that, about three quartile of the studied subjects thought that high number of professionals (more than six) when caring for patients in CPR disturbs the assistance and was overcrowded.

The relation between CPR teams' level of practice and factors affecting performance of CPR team members

The current study showed that there was a statistical significance relationship between CPR teams' level of practice and factors affecting performance of CPR team members. The present study highlighted on the effective role of team leader, synchronous team members, work environment, materials and equipment.

The findings of the present study were in the same line with **Filho et al., (2015)** who found that, presence of a leader improves the quality of care to a patient in SCA, also the organized working environment, lack of

materials and/or equipment failure, lack of familiarity with the emergency trolley and especially the harmony and synchronism of the whole team, contribute to the excellence of care to patients in SCA.

Also the findings of the present study were in the same line with **Price, Applegarth, Vu, & Price, (2012)** who conducted a study about "code blue emergencies: a team task analysis and educational initiative" and found that, effective leadership with clear communication between team members, coordinated team functioning and crowd control could affect the quality and performance of CPR team.

Conclusion

Based on the findings of the present study, it can be concluded that the knowledge of the CPR team was average in more than half of the studied subjects, CPR techniques was poor in about half of the studied CPR teams. Also factors affecting performance of CPR team were average in about two thirds of the studied CPR teams.

While regarding the factors affecting performance of CPR team, the study concluded that, there are several factors affecting the performance including demographic factors (e.g. age, years of experience, level of education and attendance of CPR courses), in addition to the organizational factors (e.g. availability of resources, hospital policy and setting) as well as personal factors (e.g. presence of well trained and highly educated team leader and presence of competent team member). Also it was found that the knowledge level of the CPR team and total number of CPR team members were affecting CPR team performance.

Recommendations

The study recommended the importance of implementing continuous training programs and recommended to

obtain basic life support and advanced life support before practicing the profession.

References

Al-Janabi, A. & Al-Ani, B. (2014) Assessment of Nurses' Knowledge towards Cardiopulmonary Resuscitation at Al-Najaf City's Teaching Hospital. Kufa Journal for Nursing Sciences;4(1):208-217.

Australian Resuscitation Council. (2017): *The ARC Guidelines*. Retrieved Jan 2018, from https:// resus.org.au/guidelines/

Berkowitz, I. (2014): *New CPR Guidelines A Change From A-B-C to C-A-B*. Retrieved Nov 2017, from heart academy: http://www.heartacademy.org/phpwc ms/index.php?Vol9No4_Page13

Castelao, E.; Russo, S.; Riethmüller, M. & Boos, M. (2013): Effects of Team Coordination during Cardiopulmonary Resuscitation: A Systematic Review of the Literature. *Journal of Critical Care*; *28*(4): 504-521.

Cook, B. & LaPierre, D. (2014): *Cardiac Arrest*. Retrieved october 1, 2018, from sharing in health: Available at: http://www.sharinginhealth.ca/conditi ons_and_diseases/cardiac_arrest.html

Ehlers, V. & Rajeswaran, L., (2014): 'Cardiopulmonary Resuscitation Knowledge and Skills of Registered Nurses in Botswana', *Curationis*; *37*(1): 17.

El-Meanawi, N. (2015): Assessment of Nurses Performance during Cardiopulmonary Resuscitation in Intensive Care Unit and Cardiac Care Unit at the Alexandria Main University Hospital. *Int Journal Sci Technol*; *4*(12): 140-149.

Elsadee, M. (2017): Nurses' Perception and Barriers as Regarding Cardiopulmonary Resuscitation. Available at: http://srv3.eulc.edu.eg/eulc_v5/Librari es/Thesis/BrowseThesisPages.aspx?fn =PublicDrawThesis&BibID=1251581 8

Farg, S. (2015): Nurse's Knowledge and Performance Regarding Children with Traumatic Brain Injury in Trauma and Intensive Care Units at Assiut University Hospita. Available at: http://srv1.eulc.edu.eg/eulc_v5/libraries/start. aspx?fn=A pplySearch&SearchId=8770088&frameNa me=&PageNo=5&PageSize=10.

Filho, C.; Santos, E.; Silva, R. & Nogueira, L. (2015): Factors Affecting the Quality of Cardiopulmonary Resuscitation in Inpatient Units: Perception of Nurses. *Revista da Escola de Enfermagem da USP*; *49*(6): 907-913.

Hunziker, S.; Tschan, F.; Semmer, N. & Marsch, S. (2013): Importance of Leadership in Cardiac Arrest Situations: From Simulation to Real Life and Back. *Swiss Medical Weekly*; *143*: (1516). DOI: https://doi. org/10.4414/smw.2013.13774

Jokari, M. & Gorjian, Z. (2017): The Effect of Educational Training on Nurses' Clinical Function of Cardiopulmonary Resuscitation. *Middle East Journal of Family Medicine*; *7*(10): 114.

Kaihula, W.; Sawe, H.; Runyon, M. & Murray, B. (2018): Assessment of Cardiopulmonary Resuscitation Knowledge and Skills among Healthcare Providers at an Urban Tertiary Referral Hospital in Tanzania. *BMC Health Services Research*; *18*(1): 935.

Kelkay, M.; Kassa, H.; Birhanu, Z. & Amsalu, S. (2018): A Cross Sectional Study on Knowledge, Practice and Associated Factors towards Basic Life Support Among Nurses Working in Amhara Region Referral Hospitals, North West Ethiopia, 2016. *Hos Pal Med Int Jnl*; *2*(2): 123-130.

Lima, S.; Macedo, L.; Vidal, M. & Sá, M. (2009): Permanent Education in BLS and ACLS: Impact on the Knowledge of Nursing Professionals. *Arquivos Brasileiros de Cardiologia*; *93*(6): 630-636.

Marsch, S.; Müller, C.; Marquardt, K.; Conrad, G.; Tschan, F. & Hunziker, P. (2004): Human Factors Affect the Quality of Cardiopulmonary Resuscitation in Simulated Cardiac Arrests. *Resuscitation*; *60*(1): 51-56.

Martin, P. (2018): *What Are the 7 Changes of the 2017 CPR Guideline Focused Updates?* Retrieved Jan 10, 2018, from https://www.procpr.org/blog/training/ 2017- cpr- guideline- focused- updates

Meaney, P.; Bobrow, B.; Mancini, M.; Christenson, J.; de Caen, A.; Bhanji, F.; Abella, B.; Kleinman, M.; Edelson, D.; Berg, R.; Aufderheide, T.; Menon, V. & Leary, M. (2013): CPR Quality: Improving Cardiac Resuscitation Outcomes Both Inside and Outside the Hospital: A Consensus Statement From the American Heart Association. *Circulation*; *128*(4): 417-35. Available at: http://circ.ahajournals.org DOI: 10.1161/CIR.0b013e31829d8654

Mohamed, A.; Elbana, H. & Elhaleim, S. (2017): Maternity Nurses' Performance Regarding Cardiopulmonary Resuscitation During Pregnancy: Simulation Based Intervention. *International Journal of Studies in Nursing*; *3*(1): 144. Available at: https://doi.org/10.20849/ijsn.v3i1.356 doi: 10. 20849/ ijsn. v3i1. 356

National Cardiopulmonary Resuscitation Association. (2017): *Acls Guidelines*. Retrieved June 2017, from https:// www. National cpr association. com/acls- study - **guide/**

National Health Services. (2017): *First Aid - CPR*. Retrieved Jan 2018, from NHS: https://www.nhs.uk/conditions/first-aid/cpr/

Nord, A. (2017): *Bystander CPR: New Aspects of CPR Training among Students and the Importance of Bystander Education Level on Survival* (Vol. 1580). Linköping University Electronic Press.

O'donoghue, S.; Madeya, S.; Fealy, N.; Saba, C.; Smith, S. & McHugh, A. (2015): Nurses' Perceptions of Role, Team Performance, and Education Regarding Resuscitation in the Adult Medical-Surgical Patient. *Medsurg Nursing*; *24*(5): 309.

Plagisou, L.; Tsironi, M.; Zyga, S.; Moisoglou, I.; Maniadakis, N. & Prezerakos, P. (2015): Assessment of Nursing Staff's Theoretical Knowledge of Cardiovascular Resuscitation in an NHS Public Hospital. *Hellenic Journal Cardiol*; *56*(2): 149-53.

Price, J.; Applegarth, O.; Vu, M. & Price, J. (2012): Code Blue Emergencies: A Team Task Analysis and Educational Initiative. *Canadian Medical Education Journal*; *3*(1): e4–e20.

Prince, C.; Hines, E.; Chyou, P. & Heegeman, D. (2014): Finding the Key to A Better Code: Code Team Restructure to Improve Performance and Outcomes. *Clinical Medicine & Research*; *12*(1-2): 47-57. Available at: doi: 10.3121/cmr.2014.1201

Rajeswaran, L.; Cox, M.; Moeng, S. & Tsima, B. (2018): Assessment of Nurses' Cardiopulmonary Resuscitation Knowledge and Skills within Three District Hospitals in Botswana. *African Journal of Primary Health Care & Family Medicine*; *10*(1): 1-6.

Refaey, A. (2012): Impact of Adesigned Teaching Protocol about Advanced Cardiac Life Support (ACLS) on Critical Care Nurse's Knowledge and Practices at Benha University Hospital, Cairo, Egypt. *Journal Am Sci*; *8*(12): 838-50.

Resuscitation Council United Kingdom. (2017): *Resuscitation Council UK*. Retrieved Nov 2017, from https://www.resus.org.uk/

Sefrin, P. & Paulus, T. (1994): Resuscitation Skills of Hospital Nursing Staff. *Der Anaesthesist*; *43*(2): 107-114. Available at: https:// europepmc. org/ abstract/ med/ 8141436
DOI: 10.1007/s001010050039

Sehgal, R. & Trikha, A. (2017): *Yearbook of Anesthesiology-6.* Jaypee Brothers Medical Publishers. Available at: https://books.google.com.eg/books?id =ZKRiDwAAQBAJ&dq=cpr+2017& hl=ar&source=gbs_navlinks_s

Shahrakivahed, A.; Masinaienezhad, N.; Shahdadi, H.; Arbabisarjou, A.; Asadibidmeshki, E. & Heydari, M. (2015): The Effect of CPR Workshop on the Nurses' Level of Knowledge and Skill. *International Archives of Medicine*; *8*: Aug. 2015. ISSN 1755-7682. Available at: https:// imed. pub/ ojs/ index. php/ iam/article/view/1292/974 doi: 10.3823/1707

Vafaei, A.; Shams Akhtari, A.; Heidari, K. & Hosseini, S. (2018): Quality of Cardiopulmonary Resuscitation in Emergency Department Based on the AHA 2015 Guidelines; a Brief Report. Emergency (Tehran, Iran); 6(1): e46.

World Health Organization. (WHO), (2016): Global Health Estimates 2015: Deaths by Cause, Age, Sex, by Country and by Region, 2000–2015. Geneva: World Health Organization; 2016. Available at: http://www.who.int/healthinfo/global_ burden_disease/estimates/en/index1.ht ml

Zacharopoulos, P.; Pretorrent, X. & Merkouris, A. (2007): Assessment of Nurses' Knowledge on Basic Cardio Pulmonary Resuscitation (B-CPR). Available at: http://ktisis.cut.ac.cy/handle/10488/97 3