Original Article

Competency In Electrocardiogram Interpretation Among Registered Nurses In Private And Government Hospitals In Nablus, Palestine

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Abstract

Background: Competency in ECG interpretation is an important skill in nursing practice since it leads to the detection of cardiovascular disorders. Incorrect interpretation of ECG findings can result in adverse patient outcomes. There has been no study done to evaluate the competency in ECG interpretation among registered nurses in Nablus, Palestine. The study aimed to assess the basic skills in interpretation of ECG among registered nurses in private and government hospitals in Nablus, Palestine. The study also evaluated the ability of the registered nurses to recognize lethal and non-lethal ECGs arrhythmias.

Method: Cross-sectional design was used. ECG questionnaire contains two parts; the 1st part including demographic data, and the 2nd part including ECG parameters, common ECG's and lethal ECG. It was distributed to (154) registered nurses in Nablus private hospitals and (146) registered nurse in Nablus governmental hospitals.

Result: Registered nurses in government hospitals have much better ability than registered nurses in private hospitals to conclude the type of arrhythmia by the shape of the ECG figure, but their ability to interpret primary ECG parameters were lower than the ability of the registered nurses in private hospitals. In contrast, the registered nurses in private hospitals have a much better ability than registered nurses in interpreting the primary ECG parameters including heart rate and rhythm.

Conclusion: There is a gap between what had been practiced in private hospitals and in government hospitals regarding nurses' competency in ECG interpretation.

Keywords: competency; electrocardiogram (ECG); interpretation; registered nurses; Nablus

الملخص

خلفية: المهارة في تفسير تخطيط القلب الكهربائي مهارة هامة لممارسات التمريض كونها تؤدي الى اكتشاف حالات أمراض القلب. عدم صحة تفسير تخطيط القلب الكهربائي قد يؤدي الى نتائج كارثية على صحة المريض. لا توجد دراسة تتعلق بتقييم مهارات الممرضات المسجلات عن تخطيط القلب الكهربائي بالمستشفيات العامة والخاصة بمدينة نابلس بفلسطين. تهدف الدراسة الى تقييم المهارات الأساسية لتفسير تخطيط القلب الكهربائي للممرضين والممرضات المسجلات بالمستشفيات العامة والخاصة بمدينة نابلس بفلسطين.

طريقة البحث: تم استخدام الدراسة المقطعية. تم استخدام استبيان تخطيط القلب الكهربائي. يتكون الاستبيان من جزئين الأول عن معلومات ديموغرافية لعينة الدراسة بينما يحتوي الجزء الثاني على معلومات أساسية عن تخطيط القلب الكهربائي، التخطيط العام والتخطيط القاتل. تم توزيع الاستبيان على ١٥٤ ممرض وممرضة مسجل بمستشفيات القطاع الخاص و١٤٦ ممرض وممرضة مسجل بمستشفيات القطاع العام بمدينة نابلس.

النتائج: الممرضون بالمستشفيات العامة أفضل من نظرائهم بالمستشفيات الخاصة فيما يتعلق بمعرفة عدم انتظام ضربات القلب من شكل التخطيط الكهربائي للقلب، بينما تقل كفاءتهم عن نظرائهم بالمستشفيات الخاصة عن تفسير اساسيات تخطيط القلب الكهربائي. الممرضون المسجلون بالمستشفيات الخاصة أفضل من نظرائهم بالمستشفيات العامة فيما يتعلق بمقارنة تخطيط القلب الكهربائي الأساسي الذي يشمل سرعة ضربات القلب.

الخلاصة: هنالك فرق في الممارسة والمهارة المتعلقة بتخطيط القلب الكهربائي لدى المرضون والممرضات المسجلون بمستشفيات القطاع العام والخاص بمدينة نابلس بفلسطين.

Introduction

Due to the technological advancement in medicine, the nursing profession demands gaining more knowledge and skills. One of the knowledge and skills that must be acquired among nurses in Critical Care Unit (CCU) and Intensive Care Unit (ICU) is electrocardiogram (ECG) interpretation competency [1]. Today's nursing profession in Palestine is expected to make independent decisions in everyday health care activities. The modern knowledge acquired by nurses gives them the ability to make those decisions, with the right attitude and experience that provide the needed skill, which together may be referred to as health care competency. Also accuracy in decision making about any health-related activity depends on elaborate health assessment, identifying specific health problems and analysis of the health parameters [2].

ECG is a valuable diagnostic tool for the healthcare provider whether they are a nurse, specialist or a doctor in cardiac disorders management. ECG is the most commonly used procedure for the diagnosis of heart disease [3]. Understanding the ECG enables the providers of the healthcare to treat and respond early and correctly to dangerous and potential deadly arrhythmias as efficiently and quickly as possible [4]. ECG interpretation is specifically essential for nurses as they are the first and the continuing one who monitors and cares patients that need an accurate and rapid acting decision making according to their assessment result. By considering that the leading cause of death worldwide is the cardiovascular disease; it's considered as nearly one third of global deaths [5]. Abnormalities of the ECG might be one of the first indications of ischemia, life-threatening arrhythmia, or metabolic disturbance. And because of that it is very essential for the nurses (specifically CCU and ICU nurses) to be able to analyze ECG reading early and accurately, in order to assist in therapeutic process and to make independent but integrated decisions in the health care [6-7]. While the ECG is such an important health parameters and it's a powerful tool, prior studies have shown that inappropriate clinical decisions occur due to faulty interpretations. More often among nurses which alarm the need for more education and training in this area [8]. Also, there is not much known studies addressed the role of nursing in ECG interpretation and their competency especially in Palestine which raised the need for this study. The significance of this study is to measure the competency of registered nurses (RNs) in the interpretation of ECG because it is important to make rapid decision when faced in emergency situations and to prevent the sequential complication of the cardiac disorder detected with the client and to assess their ability to interpret lethal or non-lethal ECG's and the primary ECG parameters [4,9].

The study aimed to assess the knowledge and basic skills in the interpretation of ECG among registered nurses in private and government hospitals in Nablus, Palestine.

Method

Design

The study design is a cross-sectional.

Study setting

This study is conducted in CCU and ICU in governmental hospitals (Rafediah hospital and Alwatani hospital) and private hospitals (Arab specialized hospital and Nablus specialized hospital).

Population and sample of the study

The population of this study included all RNs. The study sample consisted of (154) RNs in Nablus private hospitals and 146 RNs in Nablus government hospitals.

Data collecting tool of the Study

The questionnaire used for this study was developed by study authors based on literature. The questionnaire aimed to investigate the ECG interpretation knowledge and skills of RNs in private and government hospitals. The participants were observed individually to ensure single response by the same person. Before starting the questionnaire, participants were informed about the topic and the purpose of the study. They were also instructed how to complete the questionnaire.

The questionnaire has two parts: First part pertains to personal information (gender, age, year of study, year of graduation, name of the hospital where the participant is affiliated, and the duration he worked in each ward and the percentage of ECG and monitor usage daily). Second part contains (15) ECG rhythms (non-lethal and lethal ECG's figures) as categorized by (Keller and Raines, 2005). Each ECG record followed by 3 questions regards the heart rate, the rhythm and the conclusion of each. The ECG's figures used in this questionnaire are (atrial fibrillation, ST-depression, ventricular fibrillation, 1st degree AV heart block, supra ventricular tachycardia, sinus tachycardia, asystole, premature ventricular tachycardia, ST elevation, atrial flutter, ventricular tachycardia, normal rhythm, sinus bradycardia and 3rd degree AV heart block). Each question concerning the interpretation of a single ECG strip had a response time limit of (90) seconds.

Data collection

Ethical approval was secured from An-Najah National university and Nablus Ministry of Health. Then, after explaining the study, every participant was assigned a consent form. Each participant was assigned with the questionnaire and observed individually to avoid any contamination in the answers of each participant.

Data analysis

The data was analyzed using statistical package for social science (SPSS) mainly descriptive statistics methods such as percentage distribution. T-test to differentiate between two groups such as gender, and ANOVA for three groups and correlative coefficient for association were used as appropriate.

Validity and reliability

The initial questionnaire was reviewed by three experts from An-Najah national university who recommended the change of three ECG strips with much clearer figures. And decrease the number of ECG strips to decrease the time required to complete the questionnaire. Piloting 10% of the sample led to selection of 15 RNs in private hospitals and 15 RNs in government hospitals whom were asked to answer the questionnaire and give feedback about relativity, consistency and sequence of questions. This piloting took no more than 10 minutes for each student and registered nurse, and all of them gave positive feedback, and recommended to view the results of the concerned parties in college and society. Internal reliability is measured by calculating Cronbach's alpha which was good and acceptable (0.886).

Ethical consideration

Ethical approval was gained formally by Institutional Review Board (IRB) of An-Najah National University. Arabic consent form was read to each participant orally before starting exam, and the consent form emphasized that the data will be collected in anonymous, used for research goals only, and participants can withdraw from study at any time. The filled questionnaire didn't have any name (numbers will be used instead of names) and was kept in sealed bags. All data and information which was gathered was treated in confidentiality and wasn't accessed by any other without permission from the participants.

Results

The result of the statistical analysis for the data collected by the study questionnaire, for a sample consist of (154) RNs in Nablus private hospitals and (146) RNs in Nablus government hospitals.

Table 1. Demographic data of the participants and ECG perform, perceived understanding and priority (N=300)

		RN-Private (154)		RN-Government (146)	
Variables	**Category**	**Frequency**	**Percent**	**Frequency**	**Percent**
Gender	Female	61	39.6	47	32.2
	Male	93	60.4	99	67.8
Age (years)	**Mean (SD)**	21.4 (0.91)		24.17 (1.32)	
Do ECG per shift	1-2	149	96.8	20	13.6
	3-4	3	1.9	63	43.2
	5-6	2	1.3	63	43.2
Perceived ECG Understand	Nothing	34	22.1	30	20.5
	Little	120	77.9	116	79.5
Perceived ECG Priority	Yes	101	65.6	93	63.7
	No	53	34.4	53	36.3

The mean age of the RNs in private hospitals is 22 years old and the percentage of male participants was 60.4% and the percentage of female participant was 39.6%. The mean age of RNs in government hospitals was 24 years and the percentage of male participants was 67.8%, and the percentage of female participant was 32.2%. The percentages of participating RNs by hospital were 27.4% (An-Najah), 23.3% (Rafedia), 8.2% (Arabi), 22.6% (Nablus) and 18.5% (Al-Watani). Furthermore, 96.8% of RNs in private hospitals are doing ECG's in their clinical practice, approximately, one to two time per shift, 77.9% of them thought that they understand the ECG's and 65.6% of them consider the ECG interpretation as a priority for the nursing profession. On the other hand, 86.4% of the participating RNs in government hospitals are doing ECG's in their shift, approximately, 3-6 times per shift and 79.5% of them considered themselves as having little understanding of the ECG's interpretation. Only 63% of the participating RNs in government hospitals consider the ECG interpretation as a priority for the nursing profession.

Table 2. Lethal ECG interpretation competency of RN-Private and RN-Government (N=300)

Variable	RN-Private			RN-Government		
	HR	Rhythm	Conclusion	HR	Rhythm	Conclusion
	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)
A. Fib	121(78.6)	145(94.2)	85 (55.2)	98(67.1)	128(87.7)	97(66.4)
V. Fib	62(40.3)	141(91.6)	78 (50.6)	72(49.3)	112(76.7)	86(58.9)
Asystole	148(96.1)	143(92.9)	148(96.1)	138(94.5)	133(91.1)	139(95.2)
V.Tachy	115(74.7)	120(77.9)	100(64.9)	99(67.8)	87(59.6)	116(79.5)
3° AVB	133(86.4)	137(89.0)	66(42.8)	121(82.9)	110(75.3)	66(45.2)
SVT(1)	134(87)	137(89)	106(68.8)	115(78.8)	115(78.8)	109 (74.7)
SVT(2)	129(83.8)	135(87.7)	93(60.4)	118(80.8)	107(73.3)	94(64.4)

HR: heart rate; AV: atrioventricular; SVT: supra ventricular tachycardia;
3° AVB: 3rd Degree AV Heart Block

The highest percentage of RNs in private hospitals were able to correctly identify the heart rate of asystole, SVT and 3rd degree heart block (96.1%, 87%, & 86.4%, respectively) , and the rhythm, if regular or not, of atrial fibrillation, asystole, & ventricular fibrillation(94.2%, 92.9%, & 91.6%, respectively), and the conclusion for type of arrhythmia of asystole (96.1%). On the other hand, the lowest percentage of RNs in private hospitals were able to correctly identify the heart rate of ventricular fibrillation, ventricular tachycardia, and atrial fibrillation (40.3%, 74.7%, &78.6%, respectively), and the rhythm, if regular or not, of ventricular tachycardia (77.9%), and the conclusion for type of arrhythmia of 3rd degree heart block, ventricular fibrillation and atrial fibrillation (42.8%, 50.6%, 55.2%, 96.1%, respectively).

The highest percentage of RNs were able to correctly identify the heart rate of asystole, 3rd degree heart block and SVT (94.5%, 82.9%, & 80.8%, respectively), and the

rhythm, if regular or not, of asystole, atrial fibrillation and SVT (91.1%, 87.7%, & 78.8%, respectively), and the conclusion for type of arrhythmia of asystole (95.2%). On the other hand, the lowest percentage of RNs were able to correctly identify the heart rate of ventricular fibrillation and atrial fibrillation (49.3%, 67.1%), and the rhythm, if regular or not, of ventricular tachycardia (59.6%), and the conclusion for type of arrhythmia of 3rd degree heart block and ventricular fibrillation (45.2% & 58.9%).

Table 3. Non-lethal ECG interpretation competency of RN-Private and RN-Government (N=300)

Variable	RN-Private			RN-Government		
	HR	Rhythm	Conclusion	HR	Rhythm	Conclusion
	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)	Correct n (%)
1° AVB	128(83.1)	139 (90.3)	106 (68.8)	116 (79.5)	115 (78.8)	50 (34.2)
S.Tachy	133 (86.4)	115 (74.7)	140 (90.9)	118 (80.8)	117 (80.1)	110 (75.3)
PVC	105 (68.2)	103 (66.9)	89 (57.8)	88 (60.3)	91 (62.3)	92 (63.0)
A. Flutter	128 (83.1)	136 (88.3)	117 (76.0)	109 (74.7)	103 (70.5)	116 (79.5)
NSR	132 (85.7)	143 (92.9)	89 (57.8)	122 (83.6)	122 (83.6)	110 (75.3)
S. Brady	143 (92.9)	147 (95.5)	131 (85.1)	129 (88.4)	118 (80.8)	127 (87)

A. Flutter: Atrial Flutter; NSR: Normal Sinus Rhythm; S. Brady: Sinus Bradycardia; HR: heart rate; AV: atrioventricular; PVC: premature ventricular contraction.

The highest percentage of RNs in private hospitals were able to correctly identify the heart rate of sinus bradycardia (92.9%), and the rhythm, if regular or not, of sinus bradycardia (95.5%), and the conclusion for type of arrhythmia of sinus tachycardia (90.9%). On the other hand, the lowest percentage of RNs in private hospitals were able to correctly identify the heart rate of PVC (68.2%), and the rhythm, if regular or not, of PVC (66.9%), and the conclusion for type of arrhythmia of normal sinus rhythm (57.8%).

The highest percentages of RNs in government hospitals were able to correctly identify the heart rate of sinus bradycardia (88.4%), and the rhythm, if regular or not, of normal sinus rhythm (83.6%), and the conclusion for type of arrhythmia of sinus bradycardia (87%). On the other hand, the lowest percentage of RNs in government hospitals were able to correctly identify the heart rate of PVC (62.3%), and the rhythm, if regular or not, of PVC (62.3%), and the conclusion for type of arrhythmia of 1st degree heart block (34.2%). RNs in private hospitals who said to have little understanding ECG interpretation and consider it as priority for nursing profession, are more competent to analyze the rhythm ($r = .197$, $p= 0.014$, $r = .20$ $p= 0.012$, respectively) and to correctly conclude arrhythmia type ($r = .25$, $p= .002$, $r = .19$, $p= 0.017$, respectively). On the other hand, RNs in government hospitals who use ECG and considered it as priority are more competent to conclude appropriately the arrhythmia ($r= .22$, $p= .008$, $r = .21$, $p= .01$, respectively).

Table 4. Comparison between RN-Private and RN-Government on ECG interpretation; HR, Rhythm, and Conclusion (N=300)

Variable		N	Mean	SD	t test	P value
HR	RN-Private	154	11.8	2.7	1.7	.084
	RN-Government	146	11.2	3.4		
Rhythm	RN-Private	154	13.1	2.4	4.08	.001
	RN-Government	146	11.5	4.2		
Conclusion	RN-Private	154	9.3	3.4	-2.3	.019
	RN-Government	146	10.2	3.00		

In contrast, there is a significant statistical difference between private hospital RNs and government hospital RNs' interpretation of rhythm (P= .001) and conclusion (P= .019) of ECG. RNs in private hospitals have higher mean in rhythm (mean=13.1) and lower mean in conclusion (mean= 9.3) comparing with government hospital RNs (mean=11.5 and 10.2, respectively).

Discussion

This study shows that RNs in private hospitals have a much better ability than RNs in government hospitals in interpreting the primary ECG parameters including heart rate and rhythm; however, their ability to conclude the type of arrhythmia is lower than the ability of the RNs in government hospitals. Also, a study conducted by Goodridge [8] findings suggested that ICU nurses may need more education and training in ECG interpretation which we agree as proven by the result of this study.

In comparing with present study, Jablonover et al. [10] who assessed the competency in ECG interpretation among medical students, students in their clinical years have a good level of competency in interpreting the primary ECG parameters such as heart rate, the origin of heart rhythm, and electrical axis of the heart. However, their ability to recognize ECG signs of life threatening disorders and common heart abnormalities is low.

The above results could be explained as RNs in private hospitals adhere to the basic steps in the interpretation of the ECG's, which mean that they use heart rate and rhythm to conclude the type of arrhythmia. In contrast, the RNs in private hospitals is not exposed to ECG's or monitors as much as RNs in government hospitals. Furthermore, RNs in private hospitals are familiar with the parameters of the ECG's since it's required from them to utilize those parameters but the interpretation skills were regulated because most of the time, medical specialists perform this skill in private hospitals. Therefore, their experience in ECG interpretation conclusion is limited while RNs in government hospitals are much more experienced with the conclusion because they are familiar with ECG's figures and by time they will forget using the basic steps in the ECG's interpretation.

Another reason for dissipated the basic pa-

rameters interpretation of the ECG is lack of time and work overload which may away them from analyses each ECG [11].

This result of the study also shows that the RNs in private hospitals who thought themselves understand ECG and considered it as priority for nursing profession were more able to correctly analyze the rhythm and to give correct conclusion than those who did not thought themselves understand ECG and considered it as priority for nursing profession. On the other hand, RNs in government hospitals who did ECG frequently and considered it as priority are more able to appropriately conclude the type of arrhythmia, and this reflects the conclusion of Richardson [12] that "attitudes and beliefs are a subset of a group of constructs that name, define, and describe the structure and content of mental states that are thought to drive a person's actions". Furthermore, this result could be explained by that RNs who stated that they understand ECG and considered it as priority for the nursing profession try to improve their efforts on self-improvement in the area of the ECG interpretation, and by their considering the ECG interpretation as a priority, reflect their feeling of importance of the ECG as a part of their role as nurses and their willingness to get more experienced in ECG interpretation.

The study results also suggested that male RNs in private hospitals have higher mean correct answers in rate, rhythm and conclusion compared with female RNs which was similar to the conclusion that "highly competent males were rated more positively than highly competent females and males of low competence lower than similar females" [13]. On the other hand, performance by a male on a masculine task was more attributed to skill, whereas an equivalent performance by a female on the same task was seen to be more influenced by luck [13]. Contrary to prediction, the reverse did not hold true for performance on a feminine task. Overall, males were seen to be more skillful than females. That can be also explained by the fact that females in their nature prefer the tasks of caring and emotionally-related tasks, in contrast, male by their nature prefers the challenging tasks and the kind of complex and analytic tasks such as ECG interpretation.

We also found a study conducted by Varvaroussis [4] concluded that although a few primary care practitioners could diagnose the presence or absence of atrial fibrillation accurately on an electrocardiogram, but most could not, in similarities with Varvaroussis [4] statement, our result of the study suggest that the RNs have the ability to conclude the type of arrhythmia although it's not concluded from the heart rate or arrhythmia, but eventually its effective in fast detection and management of that arrhythmia and improve the patients outcome.

The joint commission required a validation of staff competency and specifies that hospitals must define and assess the competence of staff initially as part of orientation and as frequent-

ly as required by policy but no less than once every 3 years [14]. The minimum competency standard for this particular skill has not been defined in the literature. Previous attempts to substantiate competence in cardiac rhythm interpretation at the study site included short, matching style tests with computer-generated textbook rhythm strips as part of the practice of assessing competence annually. These tests failed to comprehensively evaluate the content area, and test security measures were inadequate. Nursing administrators and staff should work together to define minimum competency standards for nurses according to the patient population served. Acceptable validation methods, according to The Joint Commission, include testing, return demonstration, or use of simulation.

Based on the previous statement, there is no standard criterion to determine the competency but from the result of each party, we concluded the percentage of lack in knowledge and the percentage of the present knowledge in private and government hospital RNs in the area of ECG's interpretation.

n conclusion, Government hospital RNs demonstrated a much better ability than private hospital RNs to conclude the type of arrhythmia from the shape of the ECG figure although their ability to interpret primary ECG basic parameters were lower than the ability of the RNs in private hospitals, in contrast the RNs in private hospitals have a much better ability than RNs in government hospitals in interpreting the primary ECG basic parameters including heart rate and rhythm; however their ability to conclude the type of arrhythmia is lower than the ability of the RNs. Also, RNs in private hospitals who thought to understand ECG and consider it as priority for the nursing profession are more able to correctly analyze the rhythm and to give conclusion than the RNs in private hospitals who did not said to understand ECG or consider it as priority for the nursing profession. On the other hand, RNs in government hospitals who use ECG and considered it as priority are abler to conclude appropriately the type of arrhythmia.

Majority of the RNs in government hospitals use the ECG in their clinical practice and most of them understand it and consider it as a priority for the nursing profession, while there was a low usage of ECGs by the government hospital RNs in their working shift, and most of them demonstrated a little amount of understanding for ECG interpretation but there still remarkable percent of government hospital RNs that have lower amount of knowledge about ECG interpretation but the majority of them don't consider the ECG interpretation as a priority for the nursing profession.

There is a gap between what had been taught in nursing school and what actual at clinical setting regarding ECG interpretation. RNs lose their ability in utilizing basic parameters of ECG interpretation. The ministry of health should provide RNs a contentious teaching and training about the ECG interpretation. The curriculum of nursing must contain much

more material and using new evidence based educational methods related to the ECG interpretation with more exposure of RNs on intensive cases of ECG interpretation when teaching nursing students so basic steps in the ECG interpretation must be taught to the students in ways that can be retained and utilized after graduation.

The study recommends that, Ministry of Health is advised to provid the RNs contentious teaching and training about the ECG interpretation. The curriculum of nursing must contain much more material related to the ECG interpretation with more exposure of nursing students on intensive cases of ECG interpretation. New evidence based educational methods should be applied when teaching nursing students so basic steps in the ECG interpretation must be taught to the students in ways that can be retained and utilized after graduation.

conflicts of interest

The authors declare that they have no conflicts of interest.

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