Level of Competency among Palestinian Nurses Regarding Electrocardiogram Interpretation and Arrhythmias Management: A Cross-Sectional Study

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Abstract

Keywords
► ECG
► ECG interpretation
► arrhythmias
► arrhythmias management
► competency

Background Electrocardiographic (ECG) interpretation skills are key in providing fast attention to patients with cardiovascular diseases, enabling prevention or early detection of life-threatening situations. The main aim of the study is to determine the current competency level in ECG interpretation and arrhythmias management of nurses in critical and noncritical departments.

Method A cross-sectional design using a convenience sample of 251 nurses working in critical and noncritical departments of Northern West Bank hospitals was used. A valid and reliable structured questionnaire was used to collect data that were designed to measure the competency level in ECG interpretation and arrhythmias management.

Result About half of the participants were females (50.2%), with a mean age of 29.2 ± 5.68 years, and 50.2% of them reported they received ECG courses. Unfortunately, low competency levels in ECG interpretation and arrhythmias management of nurses in critical and noncritical departments were found as only 17.1% of the participants were competent (≥ 7.5 out of 10). Nurses working in critical care units, males, and those with higher education levels scored significantly higher than those working in noncritical units, females, and those with a bachelor's degree or diploma. Unfortunately, nurses had low competency levels not only in ECG rhythm interpretation but also in the management of arrhythmia cases.

Conclusion The level of competency in ECG interpretation and arrhythmias management among Palestinian nurses is low as only 17.1% of participants were competent in ECG interpretation and arrhythmia management. Thus, this can be considered a serious and alarming situation especially when dealing with a malignant lethal arrhythmia. Therefore, improving nurses' knowledge of ECG interpretation and management of cardiac arrhythmias is essential and warranted.

Introduction

Cardiovascular diseases (CVDs) are considered the main cause of death globally. CVDs accounted for 30 and approximately 31% of all deaths worldwide in 2008 and 2016, respectively, and the number is anticipated to climb to 23.3 million by 2030.[1] Furthermore, despite the prevalence of CVDs in 2019 being 8.3% in Gaza Strip in Palestine[2] and 13.7% in the Middle East region, the main risk factors for CVDs remain modifiable.[3] For instance, in Palestine, although there some reporting errors,[4] the prevalence of coronary artery disease (CAD) is 8.3%, primarily due to modifiable risk factors such as obesity (47.8%), hypertension (28.4%), current smoking (23.2%), diabetes (19.1%), and dyslipidemia (40.2%), with low physical activity found in 48.3% of patients,[2] placing ischemic heart disease (IHD) as the leading cause of death (31.2%) by 2019.[5]

As the prevalence of CVDs in Palestine is similar to that of the rest of the globe, multiple cases requiring diagnosis using electrocardiogram (ECG) are presented to the emergency room (ER), and thus Palestinian nurses perform and interpret ECG several times per day. So, there might a need to assess the nurses' ECG competency as it seems neglected in research and might need to be enhanced.[6] An ECG is a safe, inexpensive, and cost-effective noninvasive diagnostic technique used to evaluate the electrical activities of the heart for diagnosing IHD and cardiac arrhythmias[7] in all medical units[8] primarily in the detection of CVD.[1]

Most studies focus on the guidelines and assessment of health care providers' competency in interpretation, as well as the benefits of early prehospital diagnosis, indicating an important skill set required from nurses to assist in applying and interpreting ECG in the emergency department (ED).[9] The concept of competency combines knowledge, performance, psychomotor and problem-solving skills, as well as a responsive attitude, and focuses on professional performance for nurses, understanding and psychomotor skills that integrate knowledge with real-life practices, and continuous desire to improve by focusing on continuous learning.[10] Thus, nursing incompetence can lower patient safety and quality of care.[11]

The level of knowledge and practice regarding ECG interpretation among nurses varies significantly across settings, with a variety of explanations about the most common factors affecting them, and there is consensus that additional training is required.[7,12,13] Diverse degrees of nurse competency in the interpretation and management of arrhythmias have been observed by numerous researches performed worldwide.[11–13] For instance, emergency nurses were found to have poor proficiency in interpreting ECGs,[7] and a Turkish survey found that 61% of bedside nurses were unsure about the appropriate training for ECG monitoring or accurate arrhythmia interpretation.[14] Furthermore, Iraqi nurses lacked the skills necessary to interpret an ECG and identify arrhythmias associated with ventricular tachycardia.[15] In contrast, a study found strong competency scores in ECG interpretation among ED nurses and a high level of ECG expertise.[14]

Detecting advanced ECG alterations allows the critical and noncritical nurses to conduct an urgent evaluation and management[15] as nurses in ERs and critical care units are at the forefront of CVD assessment, evaluation, and management. Therefore, enhancing the ECG competency of the nurses can reduce the number of patients with arrhythmia disorders who receive inadequate treatment.[16]

Furthermore, lack of information and scarcity of studies on this topic warrant additional research in Palestine.[6,17]

The competency of nurses regarding ECG rhythm interpretation and arrhythmia management in the present study is defined as the number of correct rhythms. A participant who scored 7.5 out of 10 and higher was considered as competent, while nurses who scored less than 7.5 points were considered as incompetent.[18]

The study aims to measure the level of ECG interpretation and management competency and its related factors (demographic and professional) among nurses who work in critical and noncritical units.

Method

A cross-sectional study design was used to determine the level of competency regarding ECG interpretation and arrhythmia management and its related factors (demographic and professional) among Palestinian nurses working in critical and noncritical units. The study was conducted in critical and noncritical units of the governmental and nongovernmental hospitals in Northern West Bank, Palestine. The hospitals included governmental hospitals of Jenin (Martyr Khalil Suliman), Tulkarem (Martyr Thabet Thabet), and Nablus (Al-Watani Medical and Rafidia Surgical Hospitals), as well as private hospitals (Al-Arabi Specialized Hospital, Nablus Specialized Hospitals, and An-Najah National University Hospital).

The critical units included in the study were ERs and intensive care units (ICUs), while noncritical units included surgical, medical, outpatient clinics, pediatric units, and others. The inclusion of such departments allows for a comparison of ECG competency between critical and noncritical departments and to be more representative of the overall population of the nurses in Northern West Bank, Palestine.

The population of the study included all nurses who worked full-time in the targeted settings, regardless of their age, gender, educational level, or experience. Moreover, the convenience sample of the nurses was selected according to the population size (in proportion to the population size in each hospital, "the larger the population size in a hospital, the larger the sample size proportion participate in the study"). The sample size was calculated by using the Raosoft sample size calculator at a margin error of 5%, confidence level of 95%, population size of 700, and response distribution of 50%, so the estimated sample size was 249 participants.

The data were collected using a self-administered questionnaire that was developed based on previous studies and expert opinions. The questionnaire contained three sections.

The first one included demographic and professional data of the nurses (age, gender, educational level, experience, department, etc.), the second one was related to the competency level of the nurses regarding ECG rhythm interpretation using multiple-choice questions to detect the correct ECG rhythm, and the third one was related to the nurses' competency to identify the correct management of specific ECG cases. The second and third sections consisted of 15 multiple-choice questions, and each question had only 1 correct answer out of 4 possible answers. The final 15 questions had a score of 15 points, with each correct answer equal to 1 point. Once it was completed, the maximum score was converted from 15 to 10 to simplify interpretation. A score of ≥ 7.5 out of 10 was considered competent, while nurses who scored less than 7.5 points were considered incompetent.[18]

Instrument validity was done using content validity, by reviewing the questionnaire by six experts, including two faculty professors and four advanced nurses' practitioners in ER, ICU, and open wards. The feedback of these experts was taken in consideration to update the content of the questionnaire to ensure that it covers all of the targeted variables and cover a variety of ECG arrhythmias and cases.

The reliability of the questionnaire in the present study was 0.785, which was calculated by using internal consistency measurement using Cronbach's α in SPSS, with a cut point of 0.7 for acceptable reliability.

The data were collected using a self-administered questionnaire that had been filled by participants in the presence of the researchers, which allowed the participants to ask any queries to be clarified.

Before data collection began, permission was taken from the nursing manager in the hospital and the head nurse of the department. Then the aims of the study and the questionnaire were explained and clarified for the nurses participating in the study to prevent any misunderstanding that may contribute to bias.

In addition to the previous data collection process, an Online Google Form questionnaire was developed to help reach the sample size needed as it was hard to reach the participants via the previous process due to the difficult conditions in the country. This form was distributed to the nurses via Facebook groups and WhatsApp and other social media methods.

Before the final data collection, the questionnaire was distributed to 10% of the recommended sample size working in the targeted hospitals (those were not included in the final sample size), and they were asked to provide feedback on the consistency, feasibility, and build of the questionnaire, especially in terms of its coverage of various areas of ECG interpretation. The piloting process took between 10 and 15 minutes for each nurse. Responses and comments were taken into consideration as positive feedback and some structural changes were recommended and updated.

Data collection began after obtaining approval from the Institutional Review Board (IRB) of An-Najah National University (Ref: Nsg. Oct. 2023/66). The nurses were provided with a consent form. The aims of the study and its significance were clarified. Enough time was given for consent, and all information was kept confidential (by giving the questionnaires serial numbers rather than names) to ensure the participants' anonymity. The nurses received a written declaration in the informed consent form that the collected data would be kept secret and used only by the researcher for the purposes of research, and the nurses were informed of their right to withdraw from participation at any time and for any reason.

The data were analyzed using SPSS v. 25. The analysis included mean and standard deviation for continuous data and percentages for categorical data. According to the Kolmogorov–Smirnov test, data were not normally distributed, so nonparametric tests were used. The Mann–Whitney U test was used to investigate the difference between the outcome and binary variables such as gender and questions with yes/no answers, while the Kruskal–Wallis test was run to investigate the difference between outcome variables and categorical independent variables.

Results

About 251 nurses participated in this study. The mean age of the nurses was 29.2 ± 5.68 years. The work experience in the current department was 4.86 ± 5.11 years. Almost half of the nurses were females (50.2%), with the majority (76.1%) holding a bachelor's degree in nursing. About 33% worked in the medical and surgical departments, with more than half working in governmental hospitals (56.6%). Further, more than half (56.6%) had previous experience in private hospitals. About half (50.2%) reported having received ECG courses, while 27% had completed these courses in the past 2 years or more. Other related variables are shown in ►Table 1.

The competency of the nurses in ECG interpretation and arrhythmia management included two components: "competency in ECG rhythm interpretation" and "competency to identify the correct management of specific ECG cases."

Unfortunately, the result of the analysis revealed that only 17.1% of participated nurses were competent (>7.5 out of 10) in ECG interpretation and arrhythmia management.

Responses of nurses regarding ECG rhythm interpretation are shown in ►Table 2 as multiple-choice questions. The correct answers are underlined and bolded in the table. The mean score of knowledge of ECG interpretation was 5.36 ± 0.18, so nearly 70% of nurses' score of knowledge of arrhythmia management was between 5.18 and 5.54 out of 10.

In this part, the highest percentage (78.5%) of participants correctly answered the question regarding the correct order of ECG waves and intervals, while 32.7% of participants correctly answered the question about premature ventricular contractions (PVCs). Alarmingly, only 35.9% of nurses identified normal sinus rhythm, which is one of basic rhythms in ECG.

The rhythm of ventricular tachycardia was detected by nearly half (53.3%) of the nurses, which is a very concerning result as this rhythm is considered as one of the malignant lethal rhythms that need immediate intervention.

The rate of correct answers for other rhythms was between 32.7% (PVCs) and 69.3% (atrial flutter). Other related information is shown in ►Table 2.

Table 1 Demographic characteristics related to participants ($n = 251$)

Variable	n	%
Gender		
Male	125	49.8
Female	126	50.2
Academic qualification degree		
Diploma	29	11.6
Bachelor's degree	191	76.1
Higher education	31	12.4
Place of residence		
Camp	26	10.4
Village	139	55.4
City	86	34.3
Current department		
Emergency	44	17.5
Critical care	63	25.1
Medical and surgical	83	33.1
Pediatric	12	4.8
Orthopaedic	11	4.4
Others	21	8.4
Current hospital		
Private	109	43.4
Governmental	142	56.6
Previous experience in another hospital		
Private	142	56.6
Governmental	44	17.5
Has taken ECG courses		
Yes	125	49.8
No	126	50.2
If yes, when the course has been taken?		
>2 y	62	24.7
≥2 y	68	27.1

►**Table 3** displays the responses of nurses regarding identifying the correct management of specific ECG arrhythmia cases. The correct answers are underlined and bolded in the table. The mean score of knowledge of arrhythmia management was 4.55 ± 0.17, and nearly 70% of nurses scored between 4.28 and 4.72 out of 10.

The lowest percentage (31.9%) of correct answers among participant nurses was for the question about sinus bradycardia rhythm, while the highest percentage of correct answers (56.6%) was for the question regarding the management of patients with fever and a rapid heart rate.

Unfortunately, only 43.8% of the participants correctly answered the question related to the management of hypotensive patients with supraventricular tachycardia that needed emergent cardioversion, and less than half (42.6%) of the participants correctly answered the question related to unresponsive and apneic patients with ventricular fibrillation rhythm. Thus, this raises an alarm as these rhythms are considered malignant, which can be lethal if not treated immediately.

Unfortunately, nearly half (51.8%) of the participant nurses thought about checking the monitor cables when assessing a conscious and oriented patient although the monitor revealed a rhythm that appeared as a flat line (asystole), whereas the rest of nurses tended to initiate other complicated and needless interventions for the case.

As the outcome was not normally distributed, nonparametric statistical tests were used.

The results indicated that there was a statistically significant difference between male and female nurses in their competency regarding ECG rhythm interpretation ($U = 6490$, $p = 0.05$), while male nurses tend to have a higher (mean rank: 134.77) competency compared with female nurses in ECG rhythm interpretation.
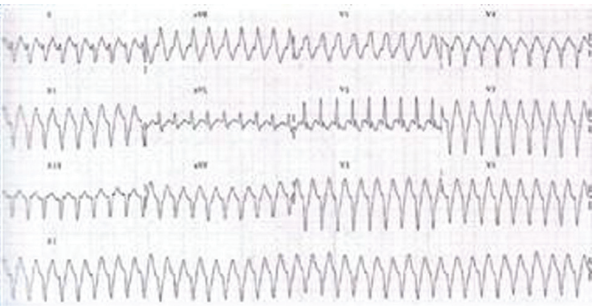
Furthermore, the Kruskal–Wallis H test showed a statistically significant difference in competency scores for ECG interpretation and arrhythmia management among nurses with different academic qualification degrees ($\chi^2 [2] = 11.988$, $p = 0.002$), with nurses with a higher education having a mean rank of competency score compared with those with bachelor's and diploma degrees (163.9 vs. 123.53 and 101.72, respectively).

Moreover, there was a statistically significant difference between the nurses' place of residence and their competency in ECG interpretation and arrhythmia management score ($\chi^2 [2] = 12.220$, $p = 0.002$) with a higher mean rank competency score among nurses with village residence (138.44) compared with those with camp residence (132.19) and city residence (104.03).

Table 2 Responses regarding nurses' competency regarding ECG rhythms interpretation

Question	Response answer			
	1 n (%)	2 n (%)	3 n (%)	4 n (%)
ECG interpretation: What is the correct order of ECG waves and intervals? **1. P wave, QRS complex, T wave, PR interval, ST interval, U wave**	**197 (78.5)**	25 (10)	10 (4)	19 (7.6)
2. T wave, P wave, QRS complex, PR interval, ST interval, U wave 3. QRS complex, P wave, PR interval, T wave, ST interval, U wave 4. I do not know				

Table 2 (*Continued*)

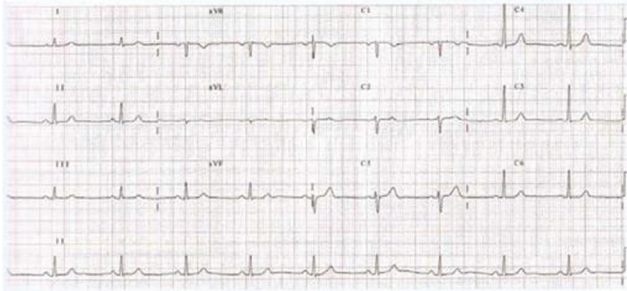| Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
You perform an ECG and observe this register. What do you think it might be? 1. A third-degree heart block **2. An atrial flutter** 3. A supraventricular tachycardia 4. I do not know	33 (13.1)	<u>**174 (69.3)**</u>	20 (8)	24 (9.6)
A patient comes to the emergency department because of respiratory distress. He has 140 beats/min. You perform an ECG and observe the following: 1. It is atrial tachycardia **2. It is atrial fibrillation** 3. It is an atrial extrasystole 4. I do not know	60 (23.9)	<u>**136 (54.2)**</u>	18 (7.2)	37 (14.7)
A hospitalized patient who had had surgery because of an AMI is transferred to the emergency department to be monitored because his vital signs are unstable. You perform an ECG and observe the following: **1. The patient is present with ventricular tachycardia** 2. The patient is present with a supraventricular tachycardia 3. The patient is present with an atrial tachycardia 4. I do not know	<u>**134 (53.4)**</u>	75 (29.9)	11 (4.4)	31 (12.4)

(*Continued*)

Table 2 (*Continued*)
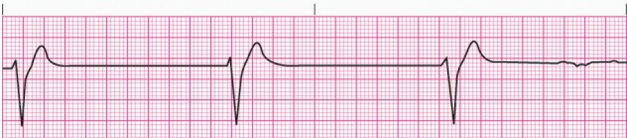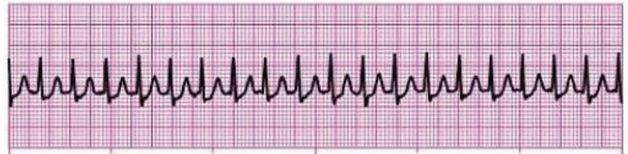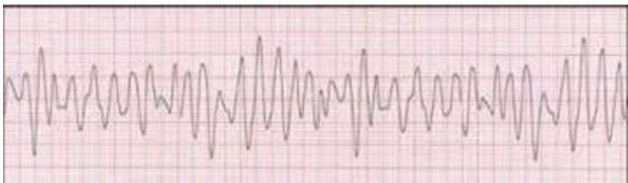
Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
A 24-year-old athletic, slim man comes to the emergency department. He reports feeling a pricking sensation in the left area of his chest since he finished exercise 3 h earlier. You perform an ECG and observe the following: 1. It is atrial bradycardia 2. He has conduction problems **3. It is a normal ECG** 4. I do not know	76 (30.3)	52 (20.7)	**90 (35.9)**	33 (13.1)
Interpret the following rhythm: Lead II **1. Sinus rhythm with PACs** 2. Normal sinus rhythm 3. Sinus tachycardia 4. Sinus bradycardia	**151 (60.2)**	37 (14.7)	27 (10.8)	36 (14.3)
Interpret the following rhythm: Lead V4 1. Sinus rhythm with multifocal premature ventricular contractions 2. Sinus rhythm with unifocal premature ventricular contractions 3. Sinus rhythm with bigeminal premature ventricular contractions 4. **Sinus rhythm with paired premature ventricular contractions (couplets)**	61 (24.3)	38 (15.1)	70 (27.9)	**82 (32.7)**
Interpret the following rhythm: Lead V1 	**141 (56.2)**	65 (25.9)	19 (7.6)	26 (10.4)

Table 2 (*Continued*)

Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
1. Idioventricular rhythm				
2. Accelerated idioventricular rhythm 3. Ventricular tachycardia 4. Ventricular fibrillation				

Table 3 Responses regarding nurses' competency to identify the correct management of specific electrocardiographic (ECG) cases

Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
The patient is admitted with a fever and rapid heart rate. The patient's temperature is 103°F (39.4°C). The nurse places the patient on a cardiac monitor and finds the patient's atrial and ventricular rates are above 105 beats/min 1. Medications to lower heart rate **2. Treatment to lower temperature** 3. Treatment to lower cardiac output 4. Treatment to reduce heart rate	57 (22.7)	<u>142 (56.6)</u>	17 (6.8)	35 (13.9)
The patient's heart rate is 165 beats/min. His cardiac monitor shows a rapid rate with narrow QRS complexes. The P waves cannot be seen, but the rhythm is regular. The patient's blood pressure has dropped from 124/62 to 78/30. His skin is cold and diaphoretic, and he is complaining of nausea. The nurse prepares the patient for: 1. Administration of β-blockers 2. Administration of atropine 3. Transcutaneous pacemaker insertion **4. Emergent cardioversion**	70 (27.9)	57 (22.7)	14 (5.6)	<u>110 (43.8)</u>
You perform an ECG and observe this register. How would you act?	<u>128 (51)</u>	39 (15.5)	56 (22.3)	28 (11.2)

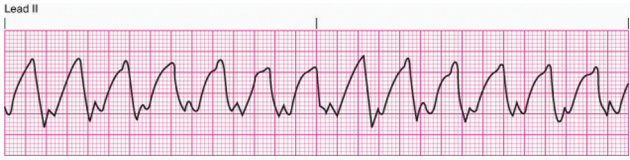(*Continued*)

Table 3 (*Continued*)
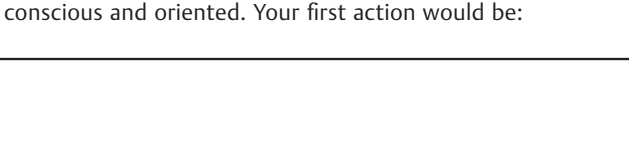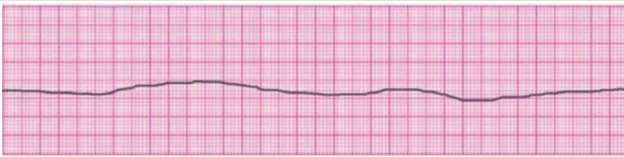
Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
1. Ask for help without leaving the patient alone because it is <u>ventricular fibrillation</u> 2. Ask for help without leaving the patient alone because it is atrial fibrillation 3. Perform another ECG because it looks like there may be interference 4. You do not know how to act but you know it must be a serious problem				
The patient is alert and talking when the nurse notices the following rhythm. The patient's blood pressure is 90/44 mm Hg. The nurse should: Lead II 1. Defibrillate immediately 2. Begin basic life support 3. Begin advanced life support **4. Treat with intravenous amiodarone or lidocaine**	90 (35.9)	29 (11.6)	29 (11.6)	<u>**103 (41)**</u>
The nurse notes the following rhythm on the heart monitor. The patient is unresponsive and not breathing. The nurse should: Lead II 1. Treat with intravenous amiodarone or lidocaine **2. <u>Provide emergent basic and advanced life support</u>** 3. Provide electrical cardioversion 4. Ignore the rhythm because it is benign	60 (23.9)	<u>**107 (42.6)**</u>	70 (27.9)	14 (5.6)
A client has the following rhythm: he is asymptomatic and has no complaints. What is the best intervention for this case? Lead II 1. Administer 0.5 mg atropine IV as the client has bradycardia **2. <u>No intervention is needed as the client has no complaints</u>** 3. Administer β-blockers to decrease heart rate as the patient has sinus tachycardia 4. I don't know	82 (32.7)	<u>**80 (31.9)**</u>	29 (11.6)	60 (23.9)
You notice that your patient's ECG rhythm suddenly changes from sinus tachycardia to the rhythm below, while the patient is conscious and oriented. Your first action would be:	54 (21.5)	58 (23.1)	9 (3.6)	<u>**130 (51.8)**</u>

Table 3 (*Continued*)

Question	Response answer			
	1 *n* (%)	2 *n* (%)	3 *n* (%)	4 *n* (%)
  1. Call code blue immediately 2. Start CPR and prepare to administer noradrenaline 3. Start defibrillator and advance life support **4. Check monitor cables**				

Likewise, there was a statistically significant difference between nurse competencies in ECG interpretation and arrhythmia management scores and their current department (χ^2 [5] = 27.463, $p < 0.001$) with a higher mean rank competency score among nurses in critical care units (152.19) compared with those in medical and surgical units (97.23) and emergency units (121.48).

Other demographic and characteristics of participants nurses, such as previous experience, current working hospital, receipt of ECG course, and timing of the ECG courses, did not show any statistically significant differences in the competency of the nurses in ECG interpretation and arrhythmia management ($p > 0.05$).

Discussion

The competency level in ECG interpretation and arrhythmia management among nurses was set at 7.5 out of 10 in this study. The results of the study showed that most of the Palestinian nurses were incompetent as an overall ECG interpretation among them was below the preset threshold (7.5 out of 10). Unfortunately, only 17.1% of nurses in critical and noncritical units in the present study were competent in ECG interpretation and arrhythmia management, which is similar to previous studies.[19,20] One of studies in Saudi Arabia on ECG interpretation and arrhythmia management[20] using a similar tool and revealed that approximately 27.1% of participants were competent, and another study[21] found that half (50%) of the nurses had not reached the minimal score to be competent in ECG interpretation and arrhythmia management. The results of the present study obviously contradicts the results of Coll-Badell et al's study[18] that evaluated the nurses' competency in three Spanish EDs and found a high competency level (average score of 8.6 out of 10), with 93% of nurses scoring ≥7.5. This difference may be related to the different study settings and the higher percentage of participants in Coll-Badell et al's study who took an ECG interpretation training course compared with the participants in the present study (91 vs. 49.8%).

In line with a study[20] that found that the nurses had difficulties in identifying atrial flutter and atrial fibrillation (58.4 and 50.2%, respectively), the present study found that the most often correctly answered questions were related to atrial flutter (69.3%) and atrial fibrillation (54.2%). However, in contrast with the present study, Tahboub and Dal Yılmaz[7] found that 84.6% of nurses were able to identify atrial flutter. In addition, although the highest correct answers in a study[20] were asystole and ventricular tachycardia (94.1 and 75.7%, respectively), unfortunately, only 53.4% of the participants in the present study correctly identified ventricular tachycardia rhythm and approximately 51.8% knew the correct management of the asystole rhythm, which raises flag as these arrhythmias are considered the most lethal arrhythmia that needs immediate action. This deference may be explained by the high number of nurses who had completed Basic Life Support (63.9%) or Advanced Cardiac Life Support (48.6%) courses in the study.[20] Therefore, on the one hand, it is not surprising that they can identify and manage the asystole and ventricular tachycardia rhythms correctly, and on the other hand, this raises the importance of implementing CE (Continuous Education), especially these courses.

Regarding the normal sinus rhythm, Jordanian nurses seem to be better in correctly identifying the normal sinus rhythm[20] than the current study participants (58 vs. 35.9%, respectively). Furthermore, while a study[20] found that between 81 and 85.5% of nurses correctly recognized the management of cardiac arrhythmias for sinus bradycardia, ventricular tachycardia, and sinus tachycardia, only 31 and 57% participants of the present study correctly recognized the management of these cases.

In addition, the current study found an association between the competency in ECG interpretation and arrhythmia management knowledge and the department nurses worked in. The mean rank of the nurses working in the critical care units was significantly higher than those working in the medical, surgical, and other units. Similar studies[19,20,22] showed similar results in that the nurses working in the ICUs and cardiac care units (CCUs) were more competent than the nurses in other departments and had a significantly greater score in the fundamental competency and understanding of ECG interpretation and arrhythmia management. Moreover, the findings of the current study also agree with

the results of the study conducted by Tahboub and Yılmaz[7] in Northern Cyprus, which revealed that most right answers were given by nurses in the ICUs, especially the CCUs.

The Mann–Whitney U test showed a nonsignificant difference between the current working hospital and the competency level among the study participants. This contradicts with finding of a previous study conducted by Qaddumi and Almahmoud[23] who found that registered nurses in governmental hospitals had a lower ability to interpret primary ECG parameters, including heart rate and rhythm, than those in private hospitals.

Data from the current study revealed a better competency level among male nurses than female nurses, with 20.8% competent male participants and only 13.5% competent female nurses. In addition, higher competency levels were observed in nurses with higher educational degrees compared with those with bachelor's degrees and diplomas. A study in line with the current study conducted by Keller et al[24] reported a positive correlation between academic qualification degree and the competency level among nurses. In contrast, Aljohani's[20] results revealed no significant difference among participants' gender, age, or work experience but agreed with the present study in that nurses with higher educational levels had better competency level and fewer obstacles in ECG interpretation and arrhythmia management.

Conclusions

The aim of this study was to identify the competency of the nurses in ECG interpretation and arrhythmia management in critical and noncritical departments in Northern West Bank hospitals in Palestine. Unfortunately, the overall results revealed that most Palestinian nurses in the Northern West Bank hospitals were below the preset competency level for ECG interpretation and arrhythmia management. Therefore, improving nurses' knowledge on monitoring ECGs and identification and management of cardiac arrhythmias is essential as some arrhythmias are life threatening and if not treated immediately may lead to death. Providing courses and training to support, enhance, and sustain nurses' competency in ECG interpretation is warranted. Thus, improvements can be achieved by collaboration between the health care systems and educational institutions through nursing education and continuous educational programs and workshops.

Limitations

Despite the importance of the study's findings, certain limitations were present. A new questionnaire was developed based on previous literature and global evidence-based Web sites, and new validity and reliability were done. Also, it was not possible to determine the impact and causal relationship by use of a cross-sectional design. Additionally, the results could not be broadly applied to all Palestinian nurses due to the use of the convenience sampling method, which decreased the study's representativeness. Additionally, the random sampling method was recommended to enhance representativeness and decrease bias.

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