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Faculty of Graduate Studies

Emergency Nursing Program

Master Thesis

The Competency Level of Emergency Nurses Regarding Electrocardiographic Interpretation in Palestine

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Thesis Approval

The Competency Level of Emergency Nurses Regarding Electrocardiographic Interpretation in Palestine

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Declaration

I certify that this thesis submitted for the degree of master, is the result of my own research, except where otherwise acknowledged, and that this study has not been submitted for another degree, university or institution.

Student’s name:

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Dedication

My research is dedicated to the Almighty Allah for save my life; give me passion, ambition and capabilities to complete this work.

To my lovely family and husband who give me support, love and inspiration, who always motivate me to succeed in my life.

To my supervisors for their assistance.

To my friends for their encouragement.

Acknowledgment

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Also, I would like to thank all people who contribute to develop this work.

Abstract

Introduction: Electrocardiogram (ECG) is of the most used tools inside emergency rooms (ER) by nurses in their diagnosing and triaging process, and therefore, it is crucial for them to acquire the suitable level of competency in ECG interpretation, which will foster health care and improve patient outcomes. The aim of the current study is to investigate the competency level among ER nurses in West Bank – Palestine regarding the interpretation of ECG, and the most corresponding sociodemographic and professional factors.

Method: A cross-sectional descriptive design was selected, and a sample of 196 ER nurses were recruited conveniently and were asked to fill a self-administered questionnaire that was based on previous literature. Data were analyzed using SPSS with the full commitment to ethical considerations.

Results: With a response rate of 86.7%, 70.9% of nurses were males, 65.3% holding bachelor's degree in nursing, 89.3% working in governmental hospitals, 46.9% with 1 – 5 years of experience, and 60.7% received previous courses related to ECG interpretation. The mean competency level of ER nurses was satisfying (60.714%), with 38.8% having poor level of competency, significantly higher among nurses with higher educational level (p-value < 0.001), who took previous ECG courses (p-value = 0.045) and life support (p-value < 0.05) and who are exposed to more ECG interpretations per day (p-value = 0.001).

Conclusion: It is recommended to focus more on ECG competency levels in the Palestinian literature, and compare between different departments, with the need to assess nurses' needs in terms of continuous education.

Keywords: Arrhythmias, electrocardiogram, ECG, interpretation, competency, nurses, emergency room

Table of Abbreviation

Abbreviation	Meaning
AAUP	Arab American University – Palestine
ACLS	Advanced Cardiac Life Support
AHA	American Heart Association
ANOVA	Analysis Of Variance
AV	Atrioventricular
AVE	Average Variance Extracted
BLS	Basic Life Support
B.Sc.	Bachelor of science
CCU	Coronary Care Unit
CPR	Cardiopulmonary Resuscitation
CR	Composite Reliability
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
ECG / EKG	Electrocardiogram
EMS	Emergency Medical Services
ER	Emergency Room
HCPs	Health Care Providers
ICU	Intensive Care Unit
IO	Intraosseous

IV	Intravenous
MCQs	Multiple Choice Questions
MI	Myocardial Infarction
MOH	Ministry Of Health
PhD	Doctor Of Philosophy
RCT	Randomized Controlled Trial
SD	Standard Deviation
SPSS	Statistical Package for the Social Science
SVT	Supra-ventricular Tachycardia
VF	Ventricular Fibrillation
VT	Ventricular Tachycardia

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Chapter One

Introduction

1.1 Background

In the nursing profession, there is a continuous need for development and improvement in areas related to assessment and diagnostic skills within the scope of nursing field. Electrocardiogram (abbreviated ECG or EKG) is a diagnostic non-invasive tool used to assess the electrical and muscular functions of the heart. ECG has a focal point in modern medicine which provides information about diagnosis of ischemic heart diseases and cardiac arrhythmias (Tahboub & Yılmaz, 2019).

ECG is considered safe, inexpensive, affordable, and essential procedure in pre-hospital emergency and in all hospital units (Rahimpour, Shahbazi, Ghafourifard, Gilani, & Breen, 2021). The main use of ECG is to help in the diagnosis process of cardiovascular diseases (CVD), especially myocardial infarction (MI) and other diseases related to heart valves. Globally, 17.3 million people died of CVD in 2008, accounting for 30% of all deaths, and the number of cardiovascular deaths is expected to rise to 23.3 million by 2030 (Al-Kindi, Al-Juhaishi, Haddad, Taheri, & Abi Khalil, 2015).

While the prevalence of CVDs in the Middle East region is considered to be high (13.7%), the main risk factors related to CVD development are still modifiable, including dyslipidemia (43.1%), diabetes mellitus (DM, 32.3%) and hypertension (30.7%), and requires interventional strategies (Bhagavathula, Shehab, Ullah, & Rahmani, 2021). In Palestine, the prevalence of coronary artery diseases (CASD) is found to be 8.3%, mainly associated with modifiable risk factors, including obesity (47.8%), hypertension (28.4%), current smoking (23.2%), DM (19.1%) and dyslipidemia (40.2%), with low physical activity found among

48.3% of the patients (Jamee Shahwan et al., 2019), which put ischemic heart diseases (IHD) as the leading cause of death (31.2%) by the year of 2019 (Vos et al., 2020). Despite the high prevalence of CVD in the Middle East, studies have shown a lack of research in this area of medicine, and considered to be behind developed countries. For example, Al-Kindi et al. (2015) stated that Middle Eastern countries participate in 3% of the worldwide publications related to CVDs, with an increase in this percentage in the last decade, mainly in gulf countries.

As the most common targeted diagnosis when conducting an ECG for a patient with a chief complaint of chest pain is MI, most studies focus on the guidelines and assessment of health care providers' competency in its interpretation, and the benefits of early prehospital diagnosis, including the decrease in time needed for door-to-balloon intervention by 30 minutes, indicating an important skills needed from nurses to help in applying and interpreting ECG in the emergency settings (Meadows-Pitt & Fields, 2014). Also, a mixed-method design study found that the most important ECG ranked diagnoses in ER were ventricular tachycardia, ventricular fibrillation, atrial fibrillation, complete atrioventricular block and normal ECG, which were rated by experienced nurses, cardiologists and emergency physicians (Penalo, Pusic, Friedman, Rosenzweig, & Lorin, 2021).

The concept of competency is considered complex, as it combines knowledge, performance, psychomotor and problem-solving skills, alongside responsive attitude, and it was investigated by several researchers, such as Nobahar (2016) who stated that competency focuses on three major areas, which are the professional functioning of nurses, understanding and psychomotor skills to collaborate knowledge with real-life practices, and continuous willingness to improve by focusing on life-long learning. ECG competency is an important skill among emergency room (ER) nurses because it is a part of the care in their triage system, which refers to the assessment and classification of patients who enter ER, and consists of two

types of decisions: primary, which consists of the assessment and determination of proper treatment process, and secondary, which is regarding the initiation of interventions. Therefore, ECG competency is important as it is also considered a crucial step in the primary care of ER patients (Malak, Mohammad Al-Faqeer, & Bashir Yehia, 2022).

Focusing on competency assessment is essential in the field of nursing because nursing profession is a combination between scientific and skill sides, and nurses need to be continuously evaluated for their ability to understand and recognize health problems, especially in emergency situations. Nursing incompetence reduces the quality of care and patient safety (Chen, Chen, Lai, Chen, & Yeh, 2021). Moreover, nursing competency assessment has shown to be superior to the conventional methods of assessment using exams, because conventional methods have the examiners not fully capable for objectivity and standardization during nurse's and student's assessment process (Harden, 2016). Also, previous studies have found a positive impact of the use of novel teaching methods in the assessment and interpretation of ECG among nursing students, such as the use of virtual teaching methods, which have been proved to be used as alternative or complementary to traditional education (Habibzadeh et al., 2019).

The competency of emergency nurses to analyze ECGs to diagnose pathological conditions and arrhythmias can help in preventing heart problems as well as decreasing the mortality rate (McGrath & Sampson, 2018). The role of nurses extends to the pre-hospital care, where it is essential to apply appropriate triage process for related cases. Study show that nurses need to have adequate skills related to early diagnosis and treatment of MI, and that the strongest predictors for under-diagnosis of pre-hospital chest pain is the lack of significant coronary history, as well as the ECG misinterpretation, and therefore, it is important to focus on the aspects of ECG among emergency nurses (Faramand et al., 2019). The investigation of the nurses' level of knowledge and practice regarding ECG interpretation is abundant in

literature, with variety of explanations about the most common factors affecting them, and such studies were conducted using different research approaches, sample sizes and competency assessment tools. In conclusion, ECG interpretation knowledge and skills is highly variant between different settings, with the agreement that further training is needed, and more focus is also needed about ECG in the academic curriculum of nursing (Tahboub & Yılmaz, 2019).

In Palestine, ER nurses are mostly nurses with bachelor's degree of nursing, while minority of them nowadays have diploma degree, and the trend of seeking higher education (master's degree in emergency nursing) is uprising. As the prevalence of CVDs trend in Palestine is not much different than in the entire world (Husseini et al., 2009), several cases that require diagnosis using ECG present in the ER, and therefore, Palestinian nurses are exposed to ECG performing and interpretation for several times a day. Thus, Palestinian nurses in the ER are in need to acquire the proper level of competency regarding ECG interpretation on multiple levels (Qaddumi, Almahmoud, Alamri, & Maniago, 2019). This study aimed to investigate the competency level of Palestinian ER nurses in the interpretation of ECG waves and arrhythmias, as well as the determination of the most common corresponding factors, whether they are sociodemographic or professional.

1.2 Problem Statement

In Western countries, cardiovascular diseases (CVDs) constitute one of the main causes of death (30% of all deaths). Chest pain is one of the most recurrent causes for consultation and assistance in emergency settings. Also, the incidence of acute MI has increased during the last decades. Competency in ECG interpretations is an essential skill for nurses because they are the first health professional who will transact with patients (Coll-Badell, Jiménez-Herrera, & Llaurado-Serra, 2017). In the Middle East, the situation is not

different, where CVDs are the most and first leading cause for 34% of all deaths (Shehab & Bhagavathula, 2019).

ECG patterns are often misinterpreted, misdiagnosed and missed. So, adverse outcomes happened (Antiperovitch et al., 2018). Emergency nurses remain at the forefront of assessment, evaluation, and management for patients with CVDs at the emergency units. As reported in the literature that nearly 30% of patients with myocardial infarction may be under triaged (McGrath & Sampson, 2018). For that, the competence in ECG interpretation of emergency nurses is still inadequate, thus, continuous training courses is urgently needed. (Haristiani R., 2021). Lack studies were done in Palestine to address the competency level among ER nurses regarding basic and arrhythmias ECG interpretation which warrants the needs to assess nurse's competence toward ECG interpretation. One study was conducted for this purpose in Palestine by Qaddumi et al. (2019), and it focused on nurses in intensive care units.

1.3 Significance of Study

Identifying and recognizing the complex and advanced ECG changes help emergency health team to make an immediate evaluation and management by a medical specialist (Faramand et al., 2019).

Emergency nurses remain at the forefront of assessment, evaluation, and management for patients with CVDS at the emergency units. As reported in the literature that nearly 30% of patients with myocardial infarction may be under triaged. (McGrath, A. & Sampson, M. 2018).

Assessing the current competency of emergency nurses regarding interpretation of ECG arrhythmias will lead to establish recommendations for ministry of health (MOH) to improve the competency level for nurses using focused ECG courses, for example, which will

help to decrease the morbidity and mortality associated with patients with ECG abnormalities. In addition, the significance of this study represented in those limited studies about this topic warrant further studies in Palestine.

1.4 Research Aim

The main goal of the study was to examine the competency level of electrocardiogram interpretations regarding normal ECG and some cardiac arrhythmias among emergency nurses in Palestine and to assess the association between socio-demographic characteristics and the competency of ECG interpretation.

1.5 Research Objectives:

The study aims to achieve the following objectives:

1.5.1 General Objectives

1. To assess the level of competency of ECG interpretation regarding cardiac arrhythmias and normal ECG among emergency nurses in Palestine.
2. To determine the association between the competency of ECG interpretation and socio-demographic data among emergency nurses in Palestine.
3. To determine the predictors of ECG interpretation competence among emergency nurses in Palestine.

1.5.2 Secondary Objectives

1. To determine the association between the competency of ECG interpretation and age.
2. To determine the association between the competency of ECG interpretation and gender.
3. To identify the associations between the competency level in ECG interpretation and types of hospital.
4. To identify the associations between the competency level in ECG interpretation and district.

5. To determine the relations between the level of competency of ECG interpretation and number of years worked in emergency unit.

6. To determine the association between the level of competency of ECG interpretation and ECG interpretation course.

7. To determine the associations between the competency level in ECG interpretation and level of education.

8. To identify the associations between the competency level in ECG interpretation and number of ECG interpretation exposure daily.

9. To identify the associations between the competency level in ECG interpretation and BLS and ACLS course taken.

1.6 Research Questions

1.6.1 Main Research Questions:

1. What is the level of competency of ECG interpretation regarding normal ECG pattern among emergency nurses in Palestine?
2. What is the level of competency of ECG interpretation regarding cardiac arrhythmias among emergency nurses in Palestine?
3. What is the association between the competency of ECG interpretation and socio-demographic data among emergency nurses in Palestine?
4. What are the predictors of ECG interpretation among emergency nurses in Palestine?

1.6.2 Specific Research Questions Include:

1. What is the relation between the competency level in ECG interpretation and age among emergency nurses in Palestine?
2. What is the relation between the competency level in ECG interpretation and gender among emergency nurses in Palestine?

3. What is the effect of level of education on the competency level among emergency nurses in Palestine?

4. What is the relation between the level of competency level regarding ECG interpretation and district?

5. What is the effect of type of hospitals on the competency level among emergency nurses in Palestine?

6. What is the relation between the level of competency of ECG interpretation and number of years worked in emergency units?

7. What is the association between the competency level of ECG interpretation and ECG courses, type and duration of course that taken?

8. What is the association between the competency level regarding ECG interpretation and number of ECG interpretation daily exposure among emergency nurses in Palestine?

9. What is the association between the competency level of ECG interpretation and BLS and ACLS courses?

1.6.3 Conceptual Definitions

Nursing competency: Is the ability to accomplish and succeed in a variety of situations by integrating clinical knowledge, judgment, skillful practices, attitude, and beliefs which reflects comprehensive nursing care (Chen et al., 2021). In nursing, Meehan (2018) defined competency as “ability to provide safe care in a manner that views a larger perspective of the patient ؛and an ability to accurately assess and critically think through the best options for care using evidence-based practice”.

1.6.4 Operational Definitions

Nursing competency: Competency in its modern approach was first presented for nursing evaluation in Ireland in 2002, and focused on the assessment of five domains:

professional/ethical practice, holistic approaches to care and the integration of knowledge, interpersonal relationships, organization and management of care and personal professional development (Cassidy et al., 2012). In the current study, competency level of nurses regarding ECG Interpretation was measured using a 15-item multiple-choice questionnaire that covered a variety of ECG arrhythmias, and was calculated by summing the number of correct answers, and then divided by 15 (total number of questions) and multiplied by 100 to get a score out of 100%. Classification of the competency score was based on previous literature (Ruhwanya, Tarimo, & Ndile, 2018) into 3 classes, where poor competency is considered when score is below 60%, while good level of competency is considered when score is 60% or above and below 80%, and excellent competency is considered when score is 80% or above.

Chapter Two

Literature review

This chapter is dedicated to review the latest and most related articles regarding the investigation of ER nurses' competency in interpreting ECG arrhythmias. It included full English articles that were published in the last five years, and using the following keywords: electrocardiogram, ECG, arrhythmias, interpretation, competency, nurses, emergency rooms, which were searched on PubMed, Google Scholar and ScienceDirect, as well as other emergency and nursing specialized journals. The review, in conclusion, shows that the level of competency among ER nurses is variant than in other departments, and is affected by several professional and demographic factors. Also, there is a need for continuous education regarding this topic, and several educational techniques showed their efficacy in increasing nurses' competency about ECG interpretation skills.

2.1 Competency level of nurses regarding ECG arrhythmias interpretation

Emergency nurses are the frontline nurses in any hospital because they are the most likely health care providers (HCPs) to first deal with any patient admitted to the hospital, and therefore, they need to acquire the suitable skills in different levels of care. Related to the previous idea, a cross-sectional study was conducted in two of the largest teaching referral hospitals in Nairobi on a sample of 84 emergency nurses, and were asked to self-rate their competency to three levels of the skills; basic, intermediate and advanced, each of which the nurse was asked to rate them on 3-level of competency; least competent, competent and highly competent, which aimed in first place to assess the educational needs for the emergency nurses based on their perceived competency. Focusing on the competency level regarding ECG interpretation, 34.5% of the nurses self-rated themselves as highly competent, compared to 42.9% for being competent and 22.6% for being least competent. Compared to

the overall skill level which the ECG interpretation was included in (advanced skills), nurses had lower overall competency, where 16.7% of the nurses self-rated themselves as highly competent in advanced skills, compared to 64.3% for competent level and 19% for least competent, which indicates above average competency level in ECG interpretation skills (Ndung'u, Ndirangu, Sarki, & Isiaho, 2022).

To start with the overall competency level of ER nurses regarding interpretation of ECG, a literature review was conducted by Haristiani and Tanrewali (2021) on a total of 8 articles (7 cross-sectional and 1 quasi-experimental) out of 233 related articles from Google Scholar, PubMed, ScienceDirect and ResearchGate to investigate the overall competency level of ER nurses regarding ECG interpretation, where the excluded articles were abstract-only, before 2016, or did not meet the required sample size. Results showed that ER nurses' competency regarding ECG interpretation is variant, where it ranged from being poor level (as shown in three articles), to be low-to-moderate (as shown in 2 of them), and being high (as shown by one article), and ranged from 54% to 93%. In general, the review concluded the urgent need for continuous education and training regarding ECG basics and interpretation skills.

A descriptive cross-sectional study was conducted on a convenient sample of 225 critical care nurses (25.9% of them are in ER) in order to investigate the competency level in interpreting and managing ECG arrhythmias. Results showed that the most correctly identified ECG arrhythmias were asystole (94.1%), followed by ventricular tachycardia (75.7%), normal sinus rhythm (69.4%) and sinus bradycardia (67.8%), while the least correctly interpreted arrhythmias were atrial fibrillation (50.2%) followed by ventricular fibrillation (53.7%), atrial flutter (58.4%) and pulseless electrical activity (63.1%), with a mean score of 6.45 ± 2.54 out of 10. Moreover, the range of correct arrhythmias management was 32.9% to 79.6%, with a mean score of 4.76 ± 2.52 out of 10. Lastly, ECG competency

level was significantly higher among nurses with higher educational level, who took previous related courses and who perceived less barriers in interpreting the ECG strips for both interpretation and management. On the other hand, working experience and department that the nurses work at had no significant relationship with ECG interpretation and management skills (Aljohani, 2022).

A study conducted by Coll-Badell et al. (2017) that aimed to examine the current competency level in ECG interpretation in emergency nurses in three Spanish emergency units. 57 questionnaires were surveyed (the response rate was 47.2%). Results of the study showed that 84.2% of the total respondents were women and the mean age was 40.5 years (Standard deviation (SD) was 9.3), with more than 91% of the sample had taken a training course regarding ECG interpretations. The mean score on the questionnaire was 8.6 points ± 1.1, and nurses who had taken training within the last 5 years from the study scored significantly more than participants that who have not taken the training course. 93% of participants scored > 7.5 points. No significant differences were seen among different emergency departments.

A comparative cross-sectional study was conducted in Iran by Rahimpour et al. (2021) and aimed to assess and compare ECG interpretation between emergency nurses and emergency medical services (EMS) personnel. A total of 170 participants were enrolled in the study, 105 of them were emergency nurses and 65 were EMS personnel. According to the results of the study, 35.2% of emergency nurses and 100% of EMS ware male. Also, the study showed that the competency of ECG interpretation for the emergency nurses scored 6.65 ± 2.16 out of 10 and for EMS personnel was 4.87 ± 1.81 (p-value < 0.05). In addition, only 38.1% of emergency nurses and 4.6% of EMS personnel had a high ECG interpretation competency. This study highlights the importance of comparing different emergency roles in terms of ECG interpretation competency, as this helps in identifying weak points among

personnel, and guide the efforts towards the suitable type of health care providers (HCPs) to increase their knowledge and competency, because each type of HCP has his/her specific role in pre- or intra-hospital care.

In a prospective quantitative survey by Werner, Kander, and Axelsson (2016) that aimed to describe the skills of ambulance nurses in interpreting an ECG in practice and to determine the factors that affect ambulance nurse’s knowledge. The study recruited all ambulance nurses working in ERs in the west of Sweden. The results showed that the mean percentage of correct answers was 54%, while in the ECG analysis part, 46% of them successfully noted acute myocardial infarction (MI) with no significant relationship between their skills in interpret ECG and factors such as education level and professional experience, except that the nurses with experience of coronary care unit (CCU) performed better on ECG interpretation test. Also showed that there are deficiency skills among ambulance nurses in ECG analysis and the only factor that linked with higher ECG interpretation knowledge is previous work experience in CCU.

In a descriptive study conducted by Tahboub and Yılmaz (2019), they aimed to evaluate nurses' knowledge and skills regarding ECGs assessment and interpretation in university hospitals in Northern Cyprus. The study recruited 72 nurses worked in intensive care units which include CCU, ER, cardiology and recovery departments. The results showed that 93.8% of participants had Bachelor of Science (B.Sc.) degrees, 60% of the participants passed the ECG training course, 69% of total answers were correct and considering to their practice of ECG interpretation, the mean total correct answers was 67%. The correct answers were most common among nurses in cardiac units. Also, the study found that nurses with less than a year of experience have the lowest score mean and highest mean among nurses with more than six years of work experience.

A cross sectional study by Qaddumi et al. (2019) that aimed to examine the basic skills in ECG interpretation and to evaluate the ability to recognize lethal and non-lethal ECG arrhythmias. The study conducted on 154 nurses in Nablus private hospitals and 146 nurses in governmental hospitals in Palestine. The results of the study reported that registered nurses in governmental hospitals have better ability than in private hospitals to conclude the type of arrhythmias by the shape of the ECG figure but their capability 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 had significantly better ECG interpretations including heart rate and rhythm.

In a cross-sectional study that done by Ruhwanya et al. (2018) which aimed to evaluate nurse's knowledge and skills to identify life threatening and fatal arrhythmias, patient management and the barriers in implementing ECG knowledge and skills. A total of 141 nurses working in critical care departments at Muhimbili national hospital, Dar es Salaam and Tanzania were included in the study. Results of this study showed that 44% of total participants aged between 31 to 40 years, three quarters were female, the mean score was 56%, 60% of them has high scores when applying the test about the knowledge of identifying life threatening arrhythmias. Also, 84.4% of nurses had poor scores when observation done to skills, 82.3% of them had the ability to identify asystole on ECG strip and demonstrate a high level of knowledge in asystole interpretation and only 38.3% of participants were able to identify heart block correctly. In general, they had poor skills, but nurses were aware about the electrode placement on the patients' chest before connecting them to the cardiac monitor. Moreover, 68.8% of respondents identified the overwhelming workload as the primary barrier to gaining and applying knowledge and skills.

In descriptive correlative study conducted by Venkatesan (2022), that purposed to assess and evaluate the knowledge and practice on ECG skills between emergency nurses in Apollo Hospital in Chennai. The sample of the study was 30 nurses who work in ER. Results showed that more than half of the nurses (53.3%) had a reasonable understanding of ECG abilities, while 46.6 % had inadequate knowledge. Another analysis results showed that the majority of participants were young nurses with age group between 21-25 years (70%), who completed bachelor's degree estimated 72%, and majority of them were females and with one to three years of experience were estimated 80%. Also, there was no correlation between demographic characteristics such as gender, education level, years of emergency experience, and ECG skill knowledge.

2.2 Effect of educational programs on ECG interpretation competency among nurses

A study by Zhang and Hsu (2013) which aimed assess the impact of a continuous educational program on knowledge of 12-lead ECG interpretations among nurses. The study conducted on 52 nurses, including nurses working in ERs, cardiac units, and intensive care unit (ICU). The results showed that the nurses who working in cardiac units had a significantly higher score in basic knowledge of ECG before training, nurses who has experience between 2 to 10 years has higher score than others, and no significant differences according to educational level. Also, the study found the post scores were higher after lectures and self-training ECG handbook, which highlights the essential role of continuous education of nurses to improve their level of knowledge and competency in interpreting ECG.

There is scarcity in published articles regarding the relationship between educational sessions and level of knowledge or competency among nurses about ECG interpretation in the recent years, but some studies investigated it among nursing students. A good example is the

comparative study that was conducted by Habibzadeh et al. (2019), who implemented a pretest-posttest quasi-experimental design to evaluate the relationship between and differences in application of virtual and traditional teaching methods on the interpretation capabilities of nursing students towards cardiac arrhythmias. The researchers recruited 60 students who were divided equally into two groups of teaching methods, and then compared using a 30-item questionnaire that was developed by the researchers. Results showed that the mean score of students in traditional (11.20 ± 4.43) and virtual (11.30 ± 2.74) teaching groups had no significant differences (p-value = 0.916), while after the teaching process, both groups had a significant increase in their knowledge scores (mean = 14.40 for traditional and 18.43 for virtual teaching methods, p-value < 0.001 for both), with a significantly higher increase in mean scores among virtual teaching method (p-value = 0.001). These results highlight two main points, where the first one is confirmatory to the importance of teaching on the level of knowledge among HCPs to acquire up-to-date information about ECG and its guidelines, and the second is regarding the importance of the implementation of modern techniques in ECG teaching, such as virtual reality and computerized software.

The previous study found opposite results to the randomized controlled trial (RCT) of Fent, Gosai, and Purva (2016), who aimed to compare between traditional lecture and the ECG simulator teaching methods on a variety of ECG interpretation skills among a sample of 168 HCPs. Although ECG simulator group nurses had higher number of teaching sessions (85 sessions) than in traditional method (14 sessions), the mean score of knowledge taken immediately after teaching was not significantly different between simulation (mean = 6.62 ± 1.73) and traditional (mean = 7.07 ± 1.88) groups (p-value = 0.120), as well as the difference between them after 3 months of teaching (mean = 5.30 ± 1.77 vs 5.79 ± 2.15, p-value = 0.55). This can be related to the adoption of a new method and that teachers may have not effective teaching skill, because this appears in the absence of a significant differences in the

participants' evaluation of teaching improved confidence, usefulness and improvement of ECG Interpretation between both groups (p-value > 0.05).

An Egyptian study regarding the same topic was conducted by Weheida, Ahmed, and Sabaan (2016) on a sample of 43 nurses (18 of them in ER) and 70 adult patients in order to evaluate the change in competency level about ECG interpretation and the expected outcomes of cardiac patients. The researchers investigate for the nurses' level of competence in 6 domains, and all showed a significant increase in level of knowledge from pre- to post-educational program phases, including immediate resuscitation (0.0% to 34.8%), monitoring abnormal ECG (0.0% to 86.0%), and assessing tachyarrhythmias (4.65% to 90.6%), with a mean increase in overall knowledge score from 7.57 ± 2.73 to 18.86 ± 2.34 (p-value < 0.001). For the difference in patients' outcomes, the percentage of patients with complications among nurses with unsatisfactory knowledge level was 83.33%, which was significantly higher than in patients with satisfactory level of knowledge (48.17%).

2.3 Teaching aspects regarding ECG interpretation

A systematic review study that was conducted by Antiperovitch et al. (2018) aimed to propose an in-training ECG interpretation competencies for both undergraduate and postgraduate trainees. They based their review on a total of 185 articles for medical students and residents that involved the investigation of ECG Interpretation competency level. Based on the reviewed articles, the researchers classified the investigated ECG arrhythmias into 4 classes according to emergency and common statuses, and therefore, 4 classes were identified. The first class involved common emergent cases, which recognition within minutes to deliver the appropriate life-saving care, such as acute ST-elevation MI, ventricular tachycardia (VT), ventricular fibrillation (VF), asystole, hyperkalemia and unstable supraventricular tachycardia (SVT), among others. The second class involved common non-emergent cases, which are seen

on a daily basis and impact the patient's care, such as tachycardia and bradycardia syndromes, and some conduction abnormalities, such as 1st degree atrioventricular (AV) block, ischemic pathologies and left ventricular hypertrophy, among others. Third, uncommon emergent cases, which, if recognized, increase the potential to prevent serious adverse outcomes, includes sinus pause, drug effects and ventricular aneurysm. Finally, the fourth class is regarding uncommon non-emergent cares, which do not require urgent medical attention but may affect patient's context, including low atrial rhythm. Moreover, the researchers proposed a set of learning objectives when providing an ECG-related training, which are: identification of ECG abnormality on a 12- or 15-lead ECG, the synthesis of ECG abnormality differential diagnosis, in order to provide the suitable type of care, especially initial treatment for the common emergent cases, followed by obtaining assistance from a senior HCP within a clinically appropriate time frame. The researchers concluded that learning objectives should also be flexible and set according to a previously identified knowledge level of the HCP involved in the training.

Educational needs regarding the competency of ER nurses for ECG interpretation can be viewed more appropriately when compared to other HCPs in ERs, for example, Hoang, Singh, and Singh (2021) conducted a study to compare the level of competency in ECG interpretation skills between attending physicians, graduated physicians and advanced practitioners (such as experienced nurses with over 10 years of experience) in terms of sensitivity and specificity, on a sample of 99 HCPs, focusing on the diagnosis of MI in 36 pre-defined cases from the databases of the patients, which were used in similar previous study by the same principal investigator. The study found that the overall sensitivity and specificity were 76.9% and 65.0%, respectively, which was higher in physicians in their 5th post-graduate year (81.7% and 65.4%, respectively), down to 64.5% and 58.3%, respectively, for physicians in their 1st year post-graduation. On the other hand, attending physicians (experienced

physicians) had 86.0% of sensitivity and 68.8% of specificity, which where close to the experienced nursing practitioners (81.9% and 62.3%, respectively). The study concluded that the findings of their study is parallel with previous literature, which indicated higher interpretation capabilities with increased education and experience, as well as the ability to change ER workflow, in which experienced practitioners may increase their role in interpreting and initially diagnose ECG findings, which allows for less interruptions for ER physicians.

A study was also conducted by Keough, Tell, Andreoni, and Tanabe (2016) to investigate the unique educational needs for ER nurses, including a sample of 167 nursing practitioners from a variety of educational levels and experience. Results showed that the top areas of educational needs for all nurses were interpretation of 12-lead ECG (70%), followed by interpretation of radiographs (67%) and pharmacology education (57%), therefore, ECG interpretation education comes in first place in the needs of ER nurses, which indicates the importance of focusing on educational and training sessions targeting ER nurses in this field.

Also, the competency level of nurses about ECG interpretation is highly affected by the competency of their lecturers and educational staff in their universities, and therefore, an Iranian multidisciplinary study was conducted by Amini et al. (2022) aimed to investigate the competency level regarding ECG interpretation among students and health care professionals in Ardabil University of Medical Sciences (n = 323), using the ECG interpretation Competency Questionnaire of Coll-Badell et al. (2017), which was adopted and modified in the current study. Results showed an overall weak ECG interpretation competency, where the mean score was 5.13 ± 2.25 out of 10 (51.3%), and the highest correctly interpreted ECG waves were atrial flutter (69.7%), followed by ventricular fibrillation and 3rd-degree atrioventricular block (66.3% each) and ventricular tachycardia (62.8%), while the highest incorrectly interpreted ECG waves were normal ECG wave (77.7%), followed by acute MI

(63.8%) and pathological Q-wave (62.2%). Results also showed that ECG interpretation competency was significantly related to the educational level of the participant (p-value < 0.001), where it was the highest among PhD degree holders (6.17), followed by master's degree holders (5.35), bachelor's degree (4.84) and associated degree holders (3.00), as well as related to the job title (p-value < 0.001), where the highest score was among physicians (6.37), followed by medical students (5.86) and nurses (5.04), while nursing students had a mean of 3.6. Significantly higher scores were also found among HCPs who took previous courses of ECG (p-value = 0.023), but not significantly related to the type of such courses (p-value = 0.136), whether they were face-to-face or online, but also significantly higher among HCPs who had an experience in working in coronary care units (CCUs, p-value = 0.014), and among HCPs of heart-specialized hospitals (5.81) compared to nonheart-specialized hospitals (5.0) and general referral hospitals (4.86, p-value = 0.005). The researchers concluded the need for continuous education as an essential factor to promote ECG interpretation skills.

Chapter Three

Methodology

3.1 Study design

Research study design defined as the structure for gathering and analyzing data on variables listed in a specific research topic (Ranganathan & Aggarwal, 2018).

A quantitative cross sectional descriptive study was used to determine the competency level of ECG interpretation regarding cardiac arrhythmias and normal ECG among ER nurses in Palestine as well as determining the relations between the competency of ECG interpretation and socio-demographic data among emergency nurses in Palestine.

The process of gathering and interpreting numerical data is known as quantitative research. It may be used to identify patterns and averages, formulate hypotheses, examine causality, and generalize findings to larger groups. (Bhandari, 2020). The quantitative research is strengthened by its reliability measurements, where it controls and eliminates the effects of extraneous variables, as well as the ability to analyze and find the relationship between several exposures in a numerical way, and is considered of the major role players in the nursing research, as it helped in the emergence of theories and guidelines (Carr, 1994).

3.2 Study settings

The study was conducted in selected hospitals (governmental and non-governmental) so it can represent all the available areas of West Bank and Jerusalem in Palestine. The recruited nurses were in the emergency rooms (ERs) of hospitals in Jenin (Martyr Khalil Suliman Governmental Hospital), Tulkarem (Martyr Thabet Thabet Governmental Hospital), Qalqilyah (Darwish Nazzal Governmental Hospital), Nablus (Rafidia And Al-Watani Governmental Hospitals), Salfit (Martyr Yasser Arafat Governmental Hospital), Tubas

(Turkish Tubas Governmental Hospital), Ramallah (Palestine Medical Complex), Hebron (Yatta, Al-Muhtaseb, Dura and Alyah Governmental Hospitals) and Jerusalem (Al-Makassid Charitable Hospital).

The targeted hospitals are suitable for the collected data because they represent all areas of West Bank (North, Middle and South) and Jerusalem, and contains suitable number of nurses for the achievement of quantitative research requirements.

3.3 Population Sample and Sampling

Study's population contains all the ER nurses who work in the targeted hospitals, regardless to age, gender, educational level, experience or any other characteristics. On the other hand, sampling method was a non-probability convenient strategy, where the researcher disseminated the questionnaire on all of the nurses in the targeted ERs, and the response rate depends on the number of nurses who sent the filled questionnaires back.

The sample size was calculated using G*Power software 3.1.9.7. Using the suitable equation, the recommended sample size was 147 nurses, and the collected number of nurses was 196, which exceeded the recommended number by a healthy margin, which allowed for the avoidance of dropout and missing values, in order to decrease the bias to its lowest possible.

3.4 Inclusion and Exclusion Criteria

Inclusion criteria: All nurses who work in the targeted ERs, with full-time job, and have more than 6 months of experience are included in the study.

Exclusion criteria: Nurses who replied with incomplete questionnaire, volunteers, with part-job time and who have less than 6 months of experience were excluded from the study.

3.5 Instruments

The researcher used a self-administered questionnaire that was developed based on previous literature and consisted of two main sections. The first section consists of close-ended questions about nurses' demographic and professional data, including age, gender, educational level, hospital type, district and experience in ER, and questions related to ECG, including whether the nurse received previous courses in ECG, Basic Life Support (BLS) or Advanced Cardiac Life Support (ACLS) and number of exposures to ECG per day.

The second section was adopted from the study of Coll-Badell et al. (2017), which included a questionnaire specifically designed for the investigation of nurses' competency in ECG interpretation, and consists of 12 close-ended multiple-choice questions (2 theoretical and 10 clinical). The designer of the questionnaire (Llaurado-Serra M.) was contacted and agreed to take the grant to edit the questionnaire in a suitable way for the current study's purposes. Eventually, the second section consisted of 15 close-ended multiple-choice questions that covered a variety of arrhythmias and ECG interpretations, from basic to advanced levels, which are consisted of the original 12 questions of the previous study, and 3 added questions based on experts' feedback. Competency score was calculated by the summation of the correct answers divided by 15, and then multiplied by 100 to have a score out of 100%, followed by the classification of the scores to three levels, where "Poor" level of competency was considered for a score of less than 60%, "Good" level of competency for scores between 60% and <80%, and "Excellent" level of competency for scores of 80% or higher, which was based on previous literature of Ruhwanya et al. (2018), because the original article did not contain a comprehensive classification of competency scores, and instead, they relied on the comparison based on mean number of correct answers.

3.6 Data collection process

The researcher reached the nurses in the targeted ERs and disseminated questionnaires in a number according to the total number of ER nurses. After agreeing to participate, the nurse was asked to fill all the answers in the questionnaire. In some ERs, the researcher waited for the nurse to answer the questionnaire, while in other ERs the researcher came back and took the filled questionnaires, and this difference is due to the distance of some hospitals from the place of residence and difficulties in transportation. The following table illustrates the distribution of the number of reached nurses and the response rate for each of the targeted hospital.

Table 3.1: Distribution of the response rate from each hospital

Hospital name	**Reached nurses**	**Responded nurses**	**Response rate**
Martyr Khalil Suliman – Jenin	20	19	95.0%
Martyr Thabet Thabet – Tulkarem	19	19	100%
Darwish Nazzal – Qlaqilyah	11	11	100%
Rafidia Surgical Hospital – Nablus	22	16	72.7%
Al-Watani Hospital – Nablus	23	12	52.2%
Martyr Yasser Arafat – Salfit	12	11	91.7%
Turkish Tubas Hospital – Tubas	11	10	90.9%
Palestine Medical Complex – Ramallah	22	22	100%
Yatta Governmental Hospital – Hebron	16	16	100%
Al-Muhtaseb Hospital – Hebron	15	15	100%
Dura Governmental Hospital – Hebron	12	10	83.3%

Alyah Governmental Hospital – Hebron	26	21	80.8%
Al-Makassed Charitable Hospital – Jerusalem	17	14	82.4%
Total	226	196	86.7%

3.7 Validity

For the validity, the questionnaire was adopted from a previous study, and then modified to include questions that cover other areas of interventions related to arrhythmias. Also, the questionnaire was reviewed by 5 experts related to the topic of the study, including 2 specialist doctors and 3 expert nurses in the field of emergency nursing and ECG interpretation, who gave a positive feedback regarding the consistency and clearance of the questions. Two expert nurses suggested the addition of questions related to management of asystole cases, and an ECG figure related to pericarditis and hyperkalemia.

3.8 Reliability

Composite reliability (CR) was calculated using SPSS software, which is preceded by the calculation of Average Variance Extracted (AVE) for the items with factor analysis above 0.5, which gave a result of 0.329, and using CR equation, the result of reliability is 0.709, which is considered high, and therefore the 15-item competency scale is reliable.

3.9 Variables

Independent variables: Nurses' age, gender, educational level, hospital type, district, years of experience, receiving previous courses and number of daily ECG interpretations (exposure).

Dependent variable: Level of competency about ECG interpretation.

3.10 Pilot study

Before the final data collection, the questionnaire was disseminated on 10% of the recommended sample size (15 nurses), who were working in the targeted hospitals, and were asked to give a feedback about the consistency and build of the questionnaire, especially in terms of it coverage to different areas of ECG interpretation. Replies were taken in consideration, and mostly focused on the clearance of ECG figures, as well as the addition of receiving courses specific to ECG interpretation, rather than focusing on BLS and ACLS. The questionnaires that were filled in the pilot period were excluded from the final analysis.

3.11 Data Analysis

For the purpose of data analysis, IBM Statistical Package for Social Sciences (SPSS) software v25.0 was used to produce descriptive results regarding the nurses' data. Descriptive statistics include the observation of frequencies and percentages of nurses' demographic data and their responses to the questions of the ECG interpretation, and the mean and standard deviation (SD) of the overall level of competency about ECG interpretation.

Also results aimed to investigate the relationship between the above mentioned independent and dependent variables, in order to test the study's hypotheses. As the data are not normally distributed, non-parametric analytical tests were used, while the type of descriptive results was based on the types of variables, therefore, Mann-Whitney U test was used to investigate the relationship between dichotomous independent variables (nurses' gender, hospital type, and whether the nurse received a course or not) and the level of competency in replacement to independent sample t-test, while Kruskal-Wallis was used to investigate the relationship between non-dichotomous independent variables (age as a categorical variable, educational level, district, experience in ER and number of ECG interpretations per day) and the level of competency in replacement to one-way analysis of

variance (ANOVA), and Spearmen Correlation test was used to investigate the correlation between nurses' age (as a scale variable) and their competency in replacement to Pearson Correlation test. The value of 0.05 was considered for the significance level (p-value) for these relationships.

3.12 Ethical consideration

Ethical approval was obtained from the health research ethics committee of the Arab American University (AAUP), from Palestinian Ministry of Health (MOH) to conduct the study in the governmental hospitals and from the private hospital administrators where the study was conducted .

A consent form was obtained from nurses. The research study objectives and its significance were explained and clarified. Enough time was given to consent, and all information remained confidential (by giving the questionnaires serial numbers rather than names) to maintain anonymity of the participants. The nurse received a written declaration in the informed consent (and verified verbally) that the collected data are kept secret, and were used by the researcher only and for the purposes of research, with the right to withdraw from the participation at any time without the need to declare any reason.

Chapter Four

Results

This chapter views the descriptive results regarding the current study data, where descriptive results include statistics regarding the frequencies, percentages and means of the nurses' sociodemographic data and their responses of questions related to ECG interpretation and descriptive results include the investigation of the relationship between nurses' sociodemographic factors and their competency level about ECG interpretation, in order to test the study's hypotheses.

4.1 Nurses' sociodemographic data

Table 4.1 distributes the sociodemographic data of the nurses who were enrolled in the current study (n = 196), and shows that most of the nurses (60.2%) are between 20 and 29 years old, with a mean age of 29.12 ± 5.67 years old, ranging from 20 to 50 years old, while another one third of the nurses (33.2%) are between 30 and 39 years old, with around three fourths of them (70.9%) are male nurses, compared to only 29.1% female nurses in emergency rooms (ER).

The table also shows that around two thirds of the nurses (65.3%) have bachelor's degree in nursing, compared to around one fourth of them (23.0%) who have diploma degree, and only 11.7% who have master's degree in emergency or other nursing specialty. The nurses who participated in the current study were mainly working in governmental hospitals (89.3%), with 40.8% of them are working in the northern West Bank district, followed by 36.7% working in southern West Bank district and 22.4% working in Middle West Bank district.

In general, less than half of the nurses (46.9%) have experience between 1 and 5 years in ER, compared to 15.8% with less than one year of experience and 24% with an experience

between 6 and 10 years. Moreover, 60.7% of the nurses stated they have received a training course about electrocardiography (ECG). Of them, 42.9% stated the last course was taken within the last 2 to 5 years, 71.4% took it face-to-face, and 63.1% had it for less than 10 hours. Lastly, more than three fourths of the nurses (75.5%) in ER stated they received a BLS course accredited from the American Heart Association (AHA), compared to almost half of them (53.1%) who received an ACLS course accredited from AHA, with around one third of them (34.7%) stated they are exposed to 5 to 10 ECG interpretations per day, compared to 26% who are exposed to 0 to 5 ECG interpretations per day. The following figures illustrate the distribution of ER nurses' sociodemographic data.

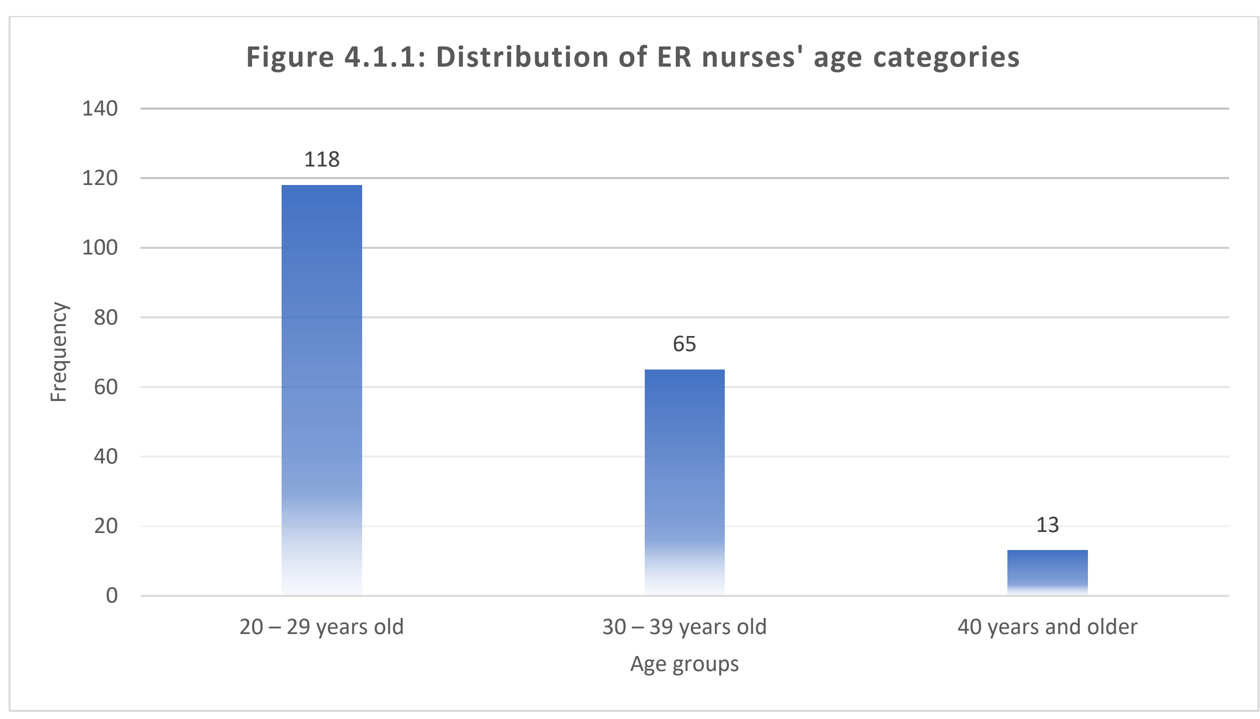
Table 4.1: Distribution of nurses' sociodemographic data in frequencies and percentages or means (ER = Emergency room, BLS = Basic Life Support, ACLS = Advanced Cardiac Life Support, AHA = American Heart Association, ECG = Electrocardiogram)

Variable	**Values**	**Frequency**	**Percentage**
Nurse's age (in complete years)	20 – 29 years old	118	60.2%
	30 – 39 years old	65	33.2%
	40 years and older	13	6.6%
Gender	Male	139	70.9%
	Female	57	29.1%
Educational level	Diploma degree	45	23.0%
	Bachelor's degree	128	65.3%
	Higher educations	23	11.7%
Hospital type	Governmental hospital	175	89.3%
	Private hospital	21	10.7%

District	Northern West Bank	80	40.8%
	Middle West Bank	44	22.4%
	Southern West Bank	72	36.7%
Experience in emergency room (ER)	< 1 year	31	15.8%
	1 – 5 years	92	46.9%
	6 – 10 years	47	24.0%
	11 – 20 years	21	10.7%
	> 20 years	5	2.6%

Did you do any training course about electrocardiography?	No	77	39.3%
	Yes	119	60.7%
If "Yes", When was the last course?	≤ 1 year	39	37.1%
	2 – 5 years	45	42.9%
	> 5 years	21	20.0%
If "Yes", How was the course taken?	Online	19	18.1%
	Face-to-face	75	71.4%
	Partial face-to-face	11	10.5%
If "Yes", How many hours was the course?	< 10 hours	65	63.1%
	10 - 20 hours	29	28.2%
	> 20 hours	9	8.7%
Do you have a BLS course accredited from AHA?	Yes	148	75.5%
	No	48	24.5%

Do you have an ACLS course accredited from AHA?	Yes	104	53.1%
	No	92	46.9%
Number of ECG interpretation exposure daily	0 – 5 times	51	26.0%
	5 – 10 times	68	34.7%
	10 – 20 times	40	20.4%
	> 20 times	37	18.9%



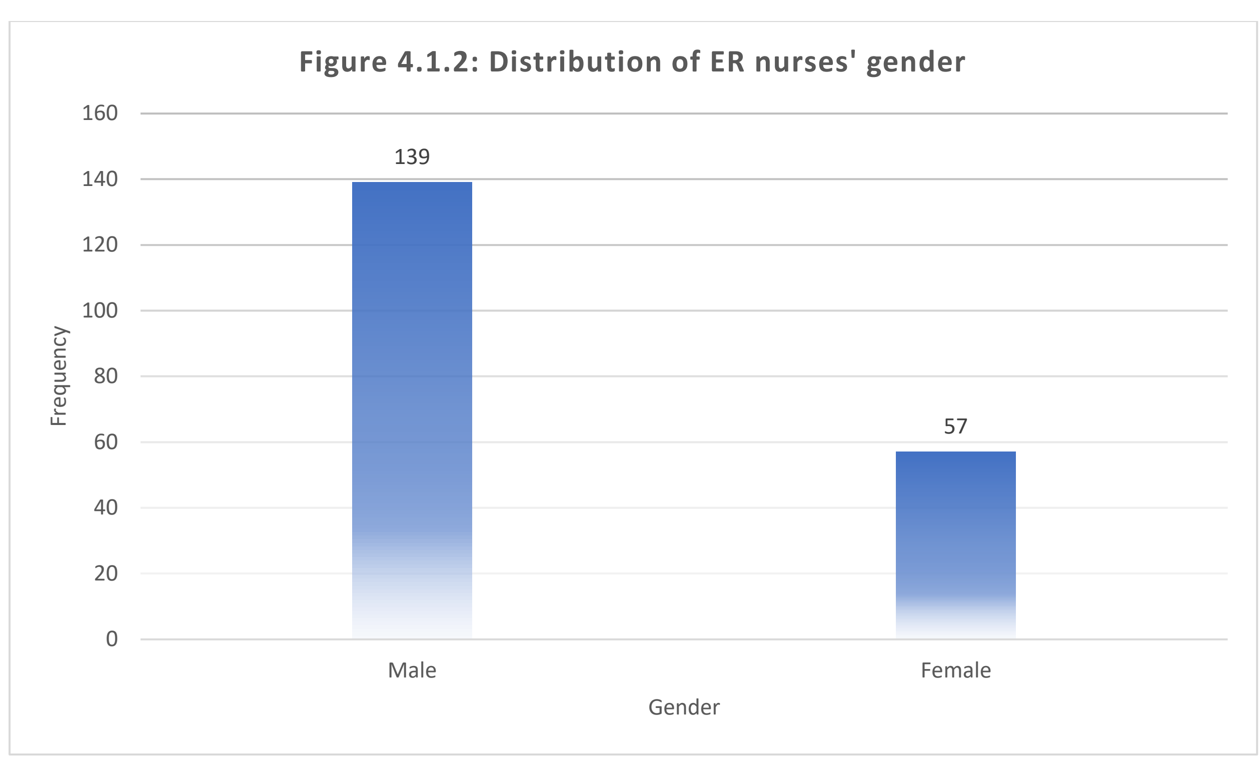


Figure 4.1.2: Distribution of ER nurses' gender
160
140
120
100
80
60
40
20
0
Frequency
139
57
Male
Female
Gender

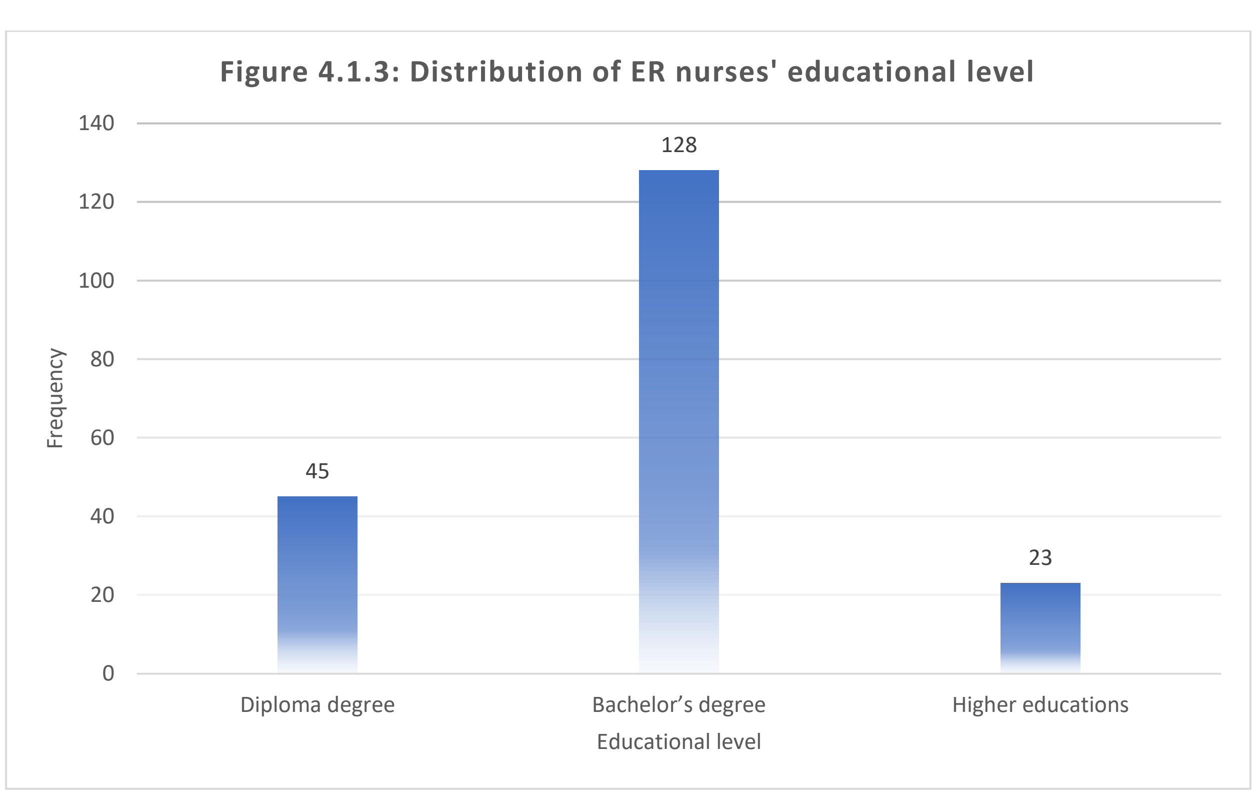


Figure 4.1.3: Distribution of ER nurses' educational level
140
120
100
80
60
40
20
0
Frequency
45
128
23
Diploma degree
Bachelor's degree
Higher educations
Educational level

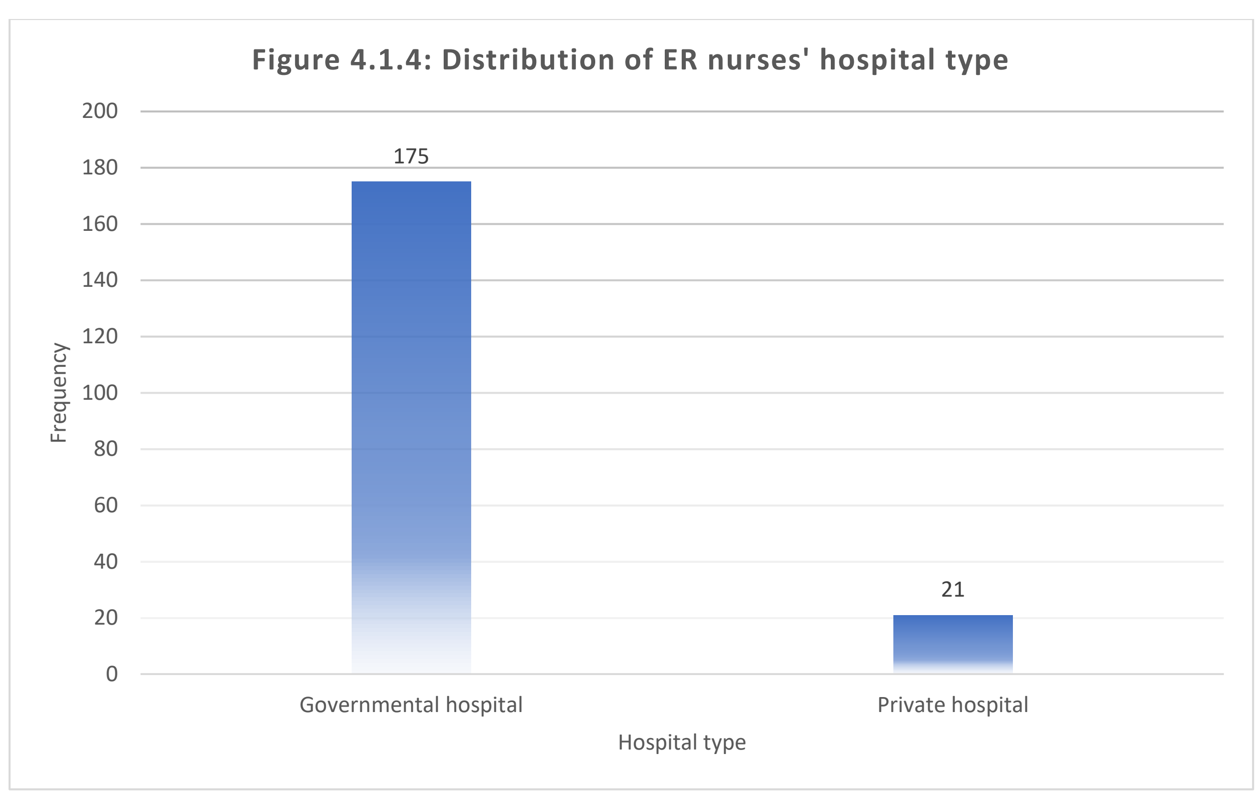


Figure 4.1.4: Distribution of ER nurses' hospital type
200
180
160
140
120
100
80
60
40
20
0
Frequency
175
21
Governmental hospital
Private hospital
Hospital type

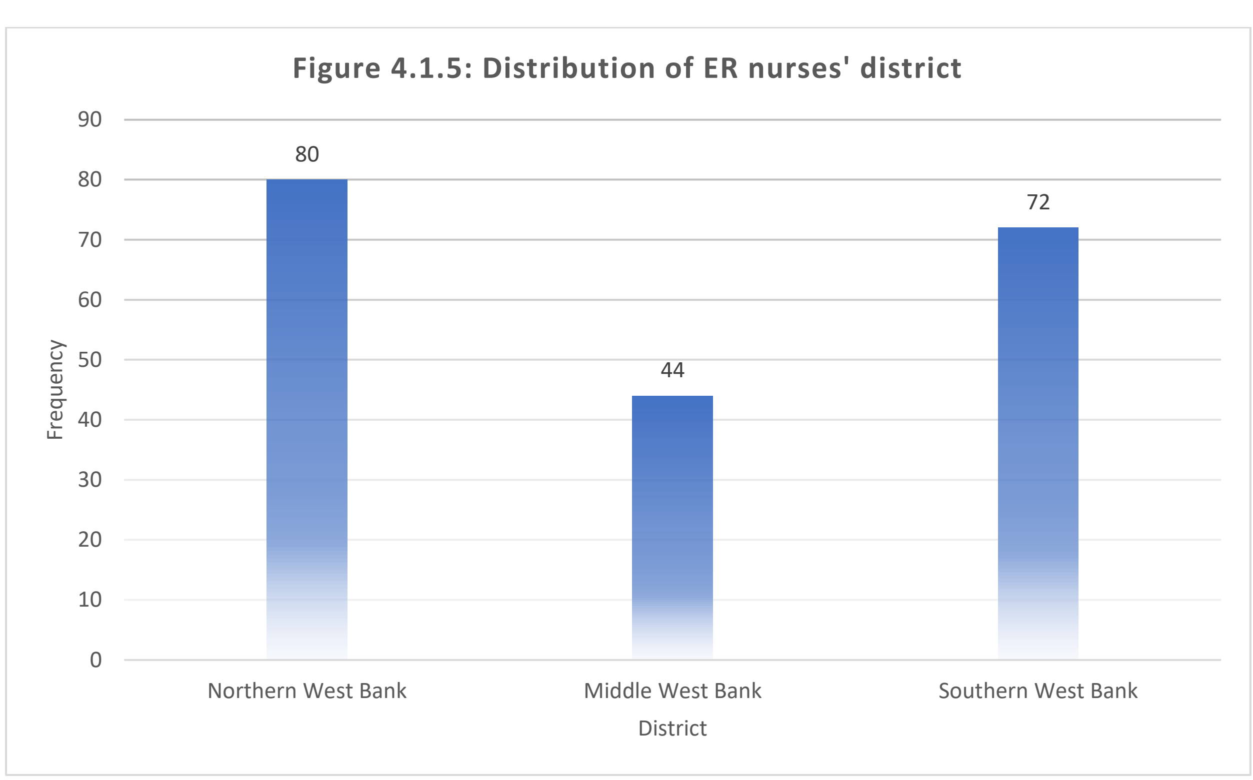


Figure 4.1.5: Distribution of ER nurses' district
90
80
70
60
50
40
30
20
10
0
Frequency
80
44
72
Northern West Bank
Middle West Bank
Southern West Bank
District

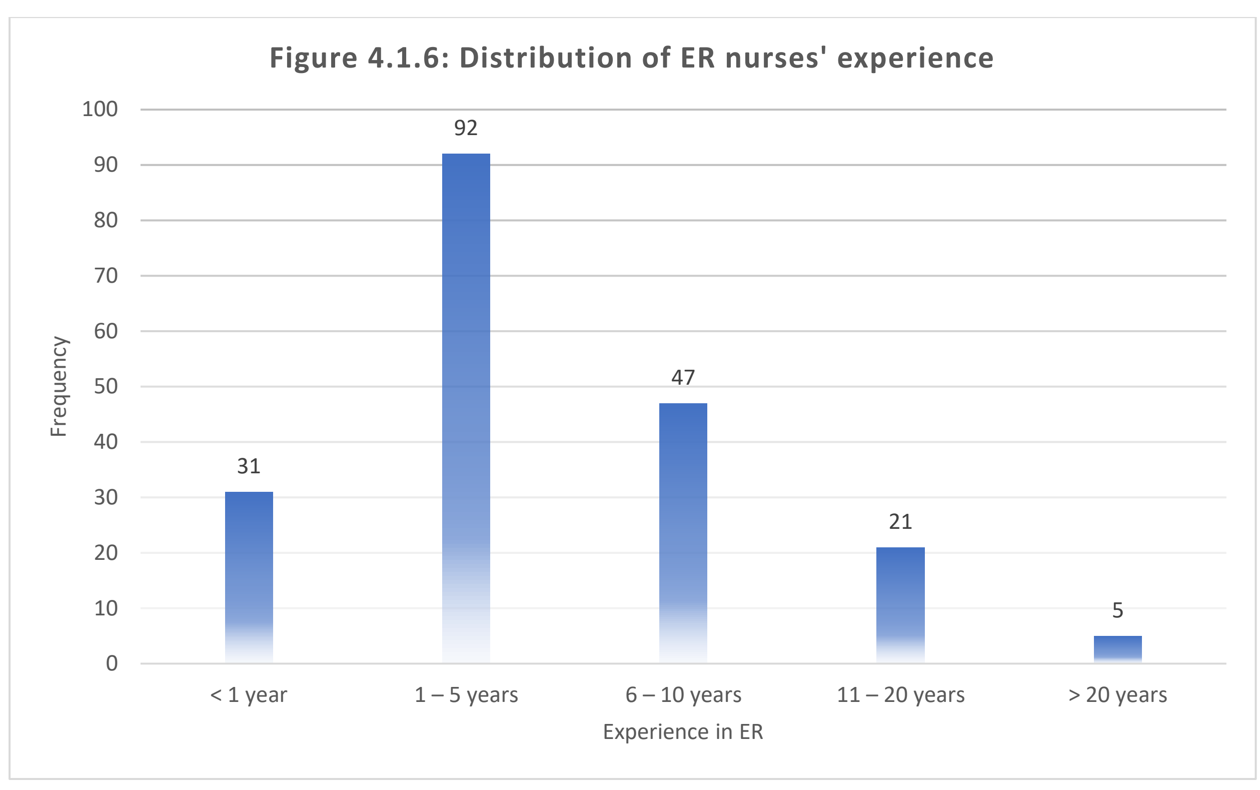


Figure 4.1.6: Distribution of ER nurses' experience
Frequency
100
90
80
70
60
50
40
30
20
10
0
92
47
31
21
5
< 1 year
1 – 5 years
6 – 10 years
11 – 20 years
> 20 years
Experience in ER

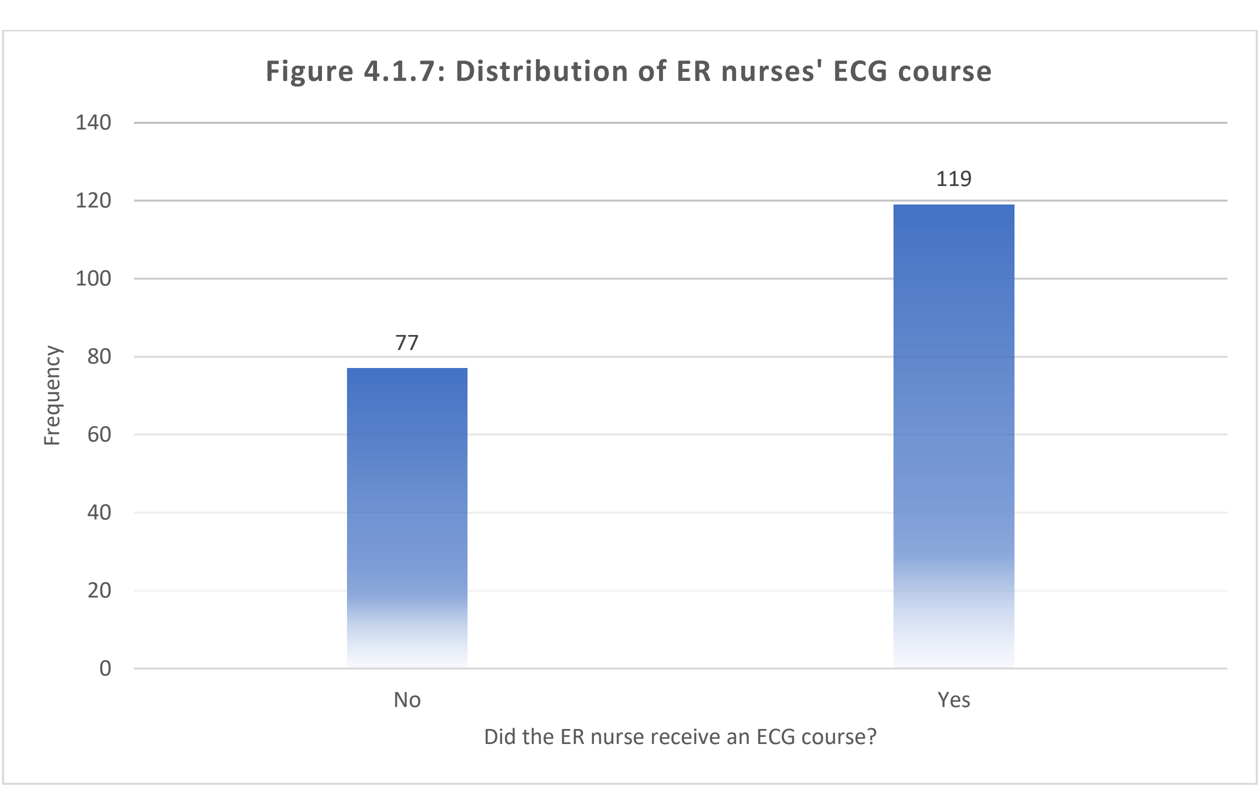


Figure 4.1.7: Distribution of ER nurses' ECG course
Frequency
140
120
100
80
60
40
20
0
119
77
No
Yes
Did the ER nurse receive an ECG course?

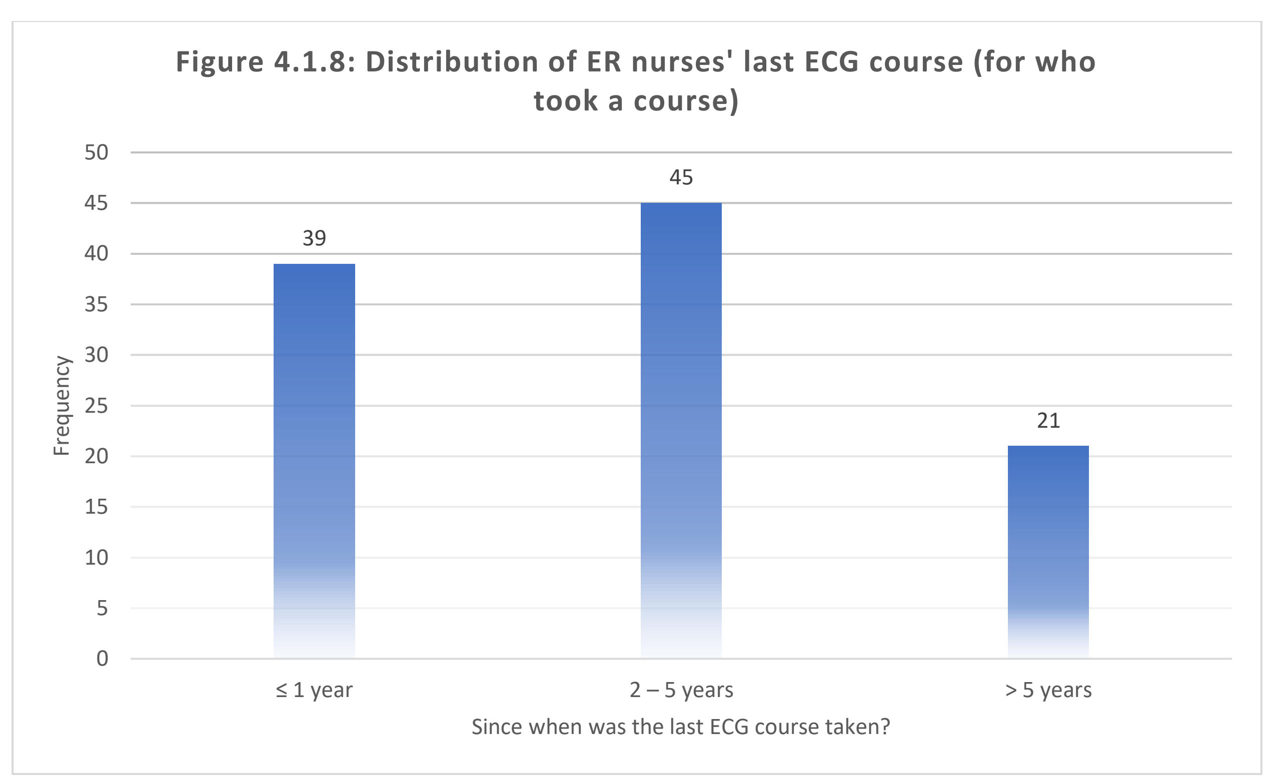


Figure 4.1.8: Distribution of ER nurses' last ECG course (for who took a course)
Frequency
50
45
40
35
30
25
20
15
10
5
0
39
45
21
≤ 1 year
2 – 5 years
> 5 years
Since when was the last ECG course taken?

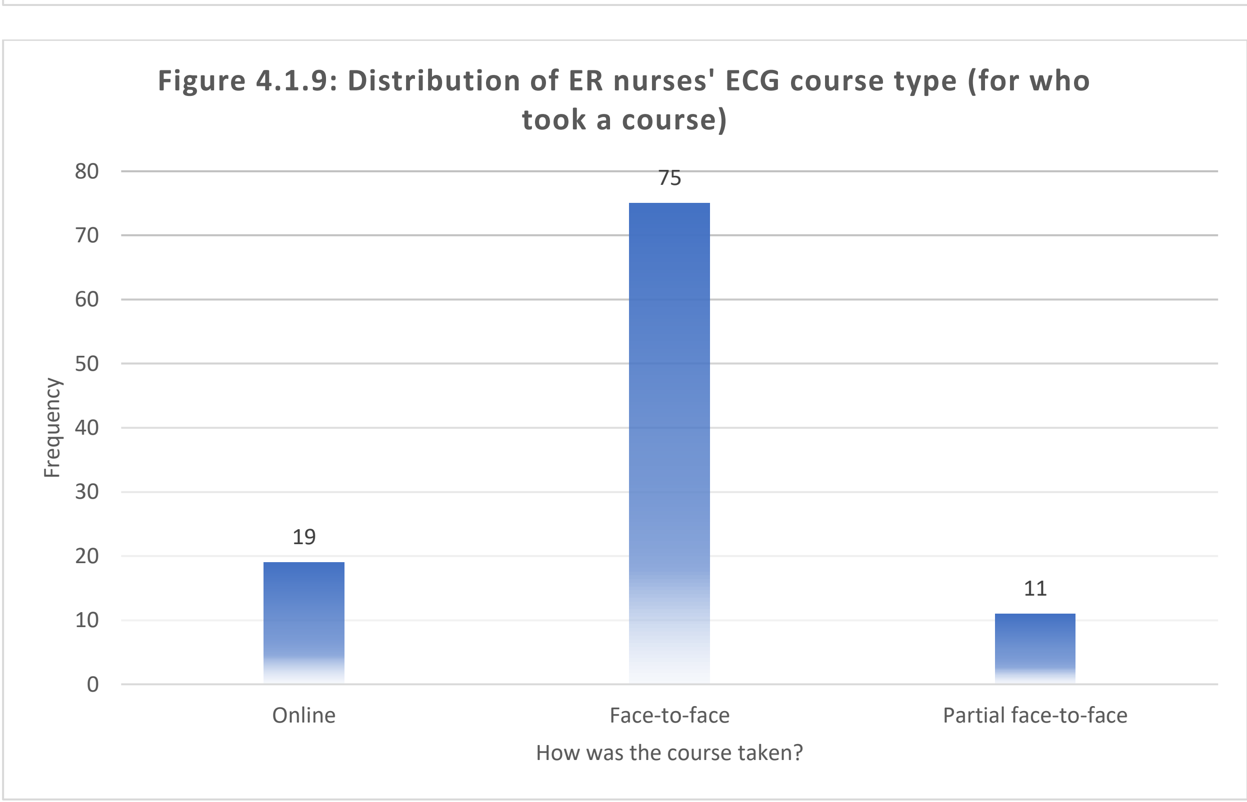


Figure 4.1.9: Distribution of ER nurses' ECG course type (for who took a course)
Frequency
80
70
60
50
40
30
20
10
0
19
75
11
Online
Face-to-face
Partial face-to-face
How was the course taken?

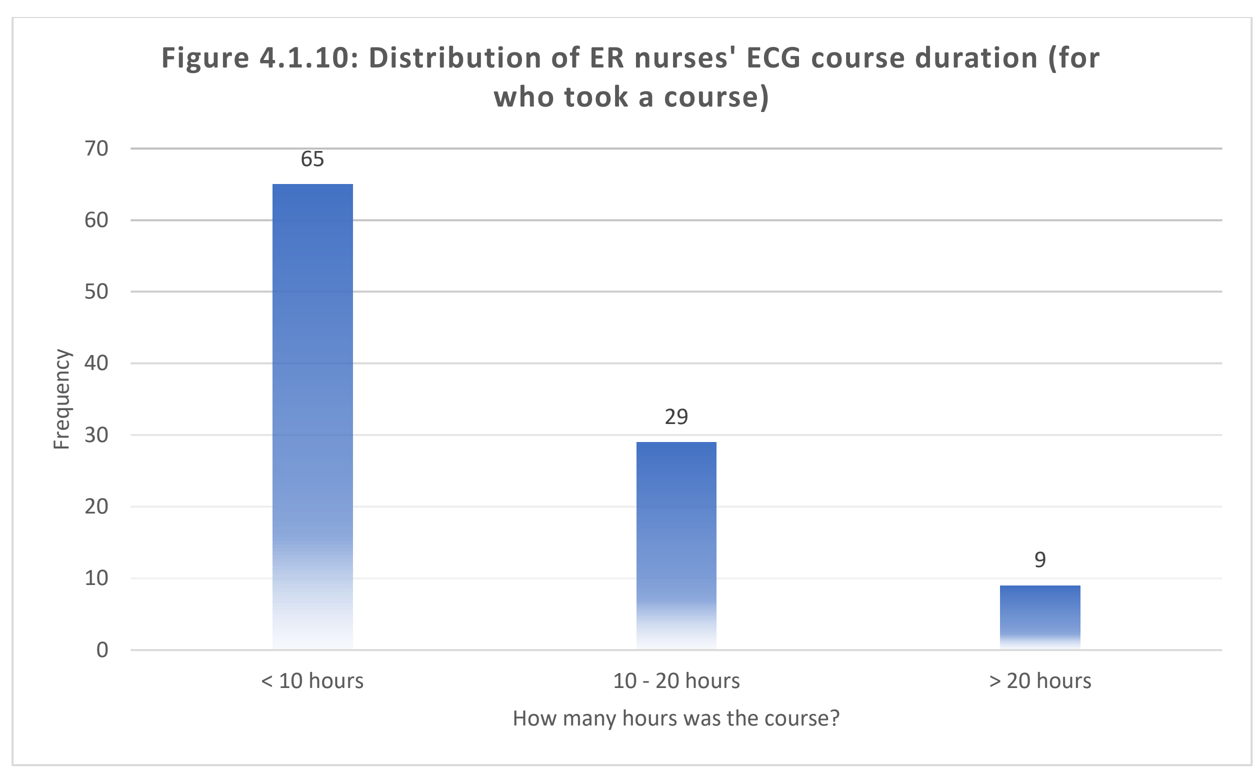


Figure 4.1.10: Distribution of ER nurses' ECG course duration (for who took a course)
Frequency
70
60
50
40
30
20
10
0
65
29
9
< 10 hours
10 - 20 hours
> 20 hours
How many hours was the course?

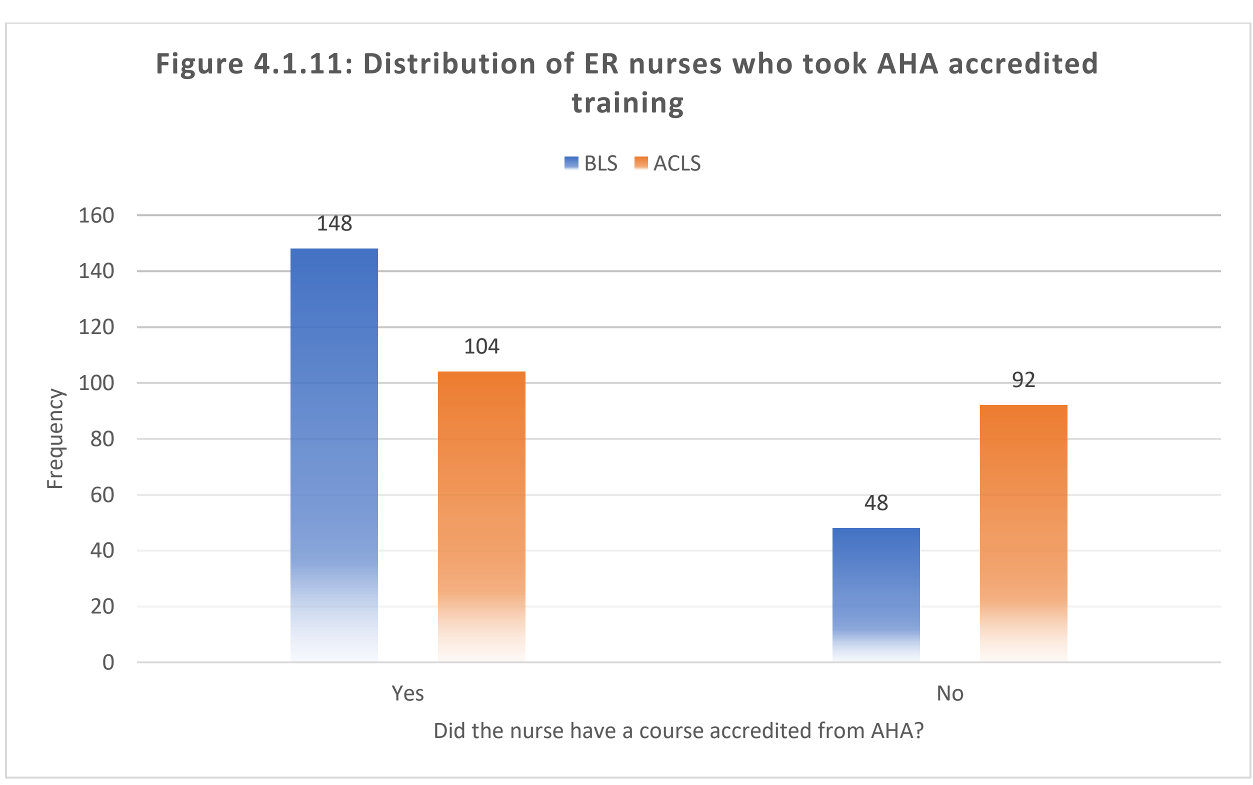


Figure 4.1.11: Distribution of ER nurses who took AHA accredited training
BLS
ACLS
Frequency
160
140
120
100
80
60
40
20
0
148
104
48
92
Yes
No
Did the nurse have a course accredited from AHA?

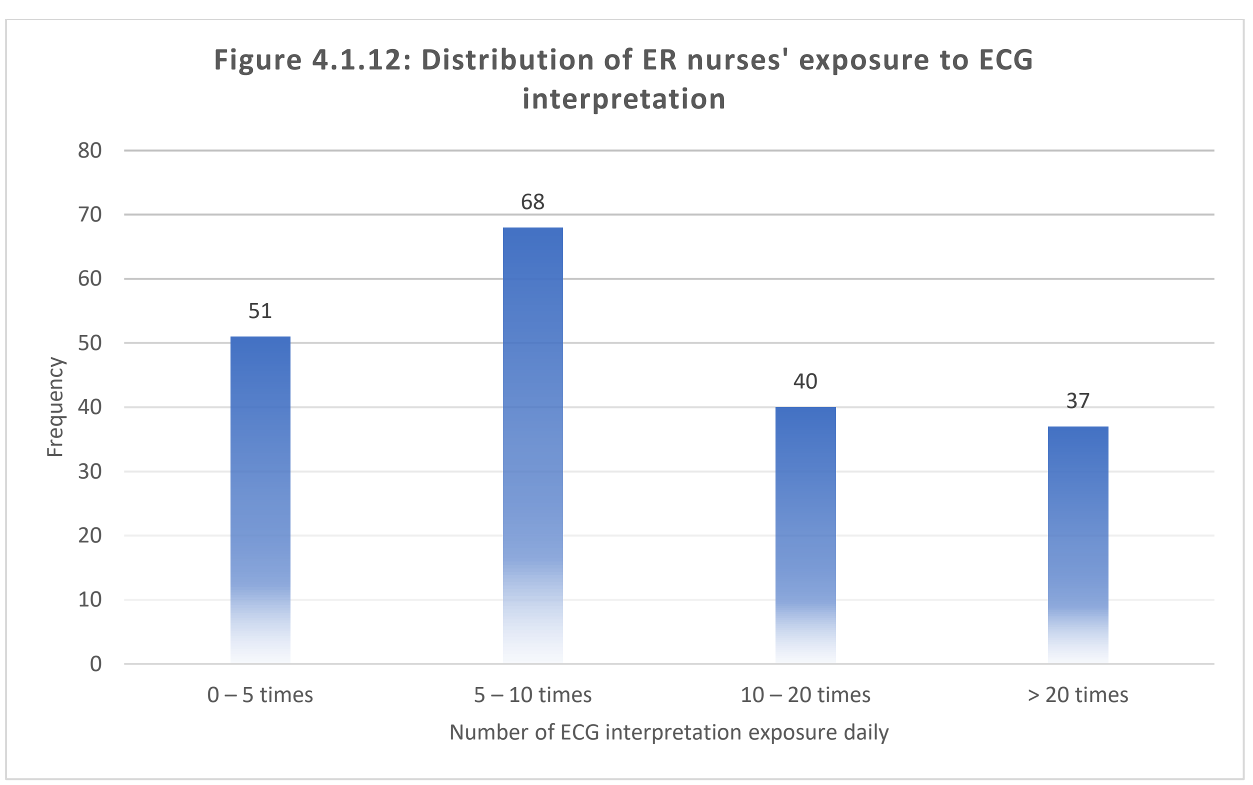


Figure 4.1.12: Distribution of ER nurses' exposure to ECG interpretation
80
70
60
50
40
30
20
10
0
Frequency
51
68
40
37
0 – 5 times
5 – 10 times
10 – 20 times
> 20 times
Number of ECG interpretation exposure daily

4.2 Level of competency about ECG interpretation among ER nurses

This part shows the results regarding the level of competency among ER nurses about ECG interpretation through questioning them using multiple-choice questions (MCQs), as shown in Table 4.2.1, which distributes the answers of the nurses regarding these questions, and highlights the correct answer for each question. Also, this part includes the investigation of the overall level of competency among the nurses, which is defined by the total number of correct answers out of the 15 questions, and quantitatively described in Figure 4.2.2.

Table 4.2.1 shows that majority of ER nurses have answered most of the questions correctly, while other questions witnessed a decreased level of competency as they were specific in their coverage. For example, 78.1% of the ER nurses correctly answered the correct order of ECG waves and intervals, and 72.4% answered correctly that an atrial conduction problem is indicated by the absence of P-wave, while 67.9% answered correctly about a given figure of ECG regarding atrial flutter.

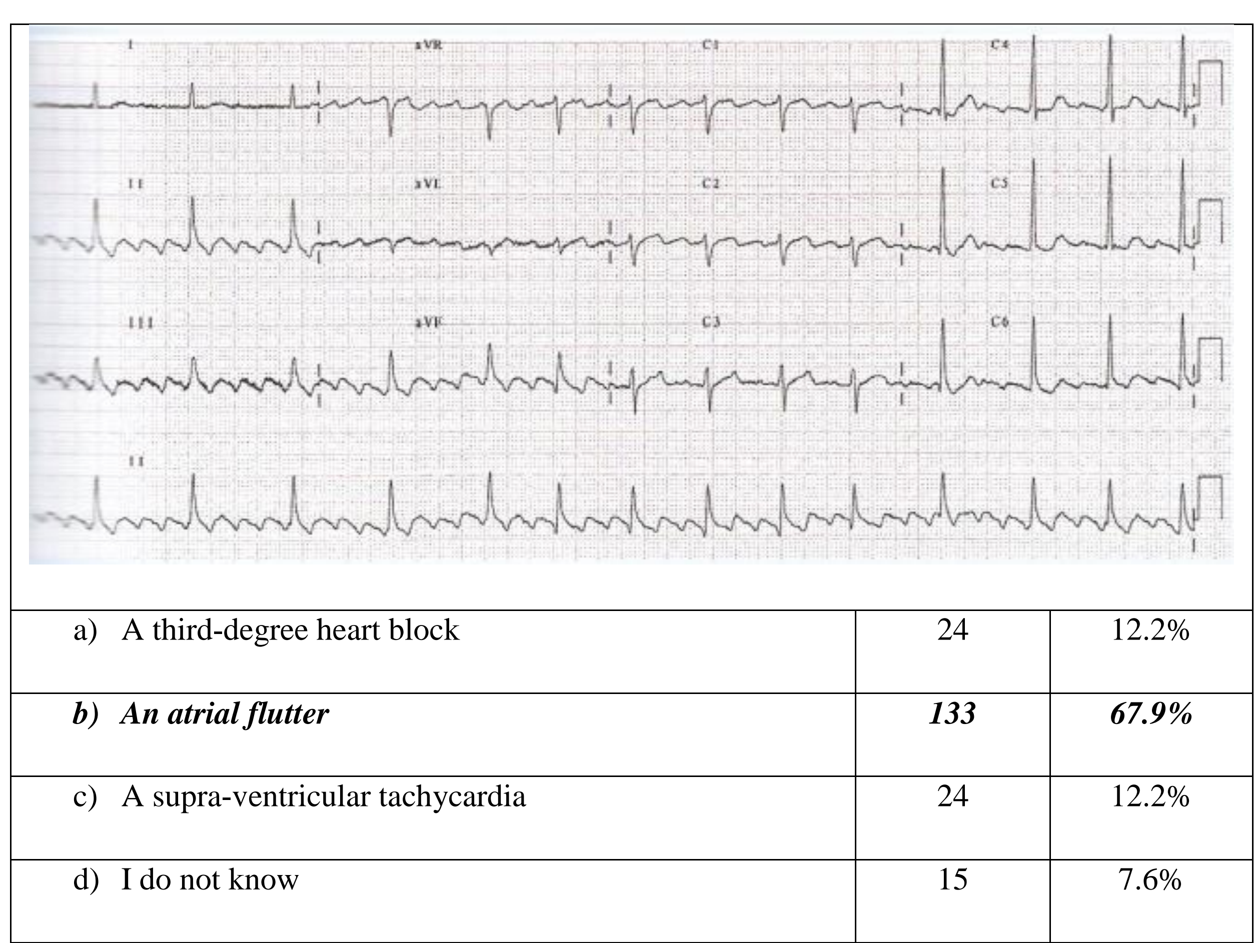
Another given ECG figure was in the fourth question (ventricular fibrillation), which was correctly identified and managed by 73% of the ER nurses, while an atrial fibrillation was correctly identified by 60.2%, and 59.2% correctly identified the pathological Q wave in a given ECG figure in Question 6. Approximately, 63.8% of the ER nurses correctly identified a third-degree heart block in a given ECG figure, with 60.2% correctly identifying a ventricular tachycardia.

On the other hand, one of the questions that showed decreased level of competency is the ninth question, in which 32.1% of the nurses correctly identified the presence of MI with pathological Q wave, while 49.5% of them identified it as merely MI. also, less than half of the nurses (44.9%) correctly observed a ventricular extra-systole in a given ECG figure, and 24.5% of them correctly diagnosed a pericarditis using a given ECG figure as in Question 15.

Although, 73% of the nurses correctly identified a supra-ventricular tachycardia (SVT) in the 12th question, with 74% correctly identified the appropriate action when asystole is found, which is the activation of emergency team and starting high quality CPR, while 60.7% correctly identified the presence of hyperkalemia in a given ECG figure. Figure 2.1 illustrates the distribution of the frequency of correct answers for each question, while Figure 2.2 illustrates the frequency of the number of correct answers out of 15 for the whole sample.

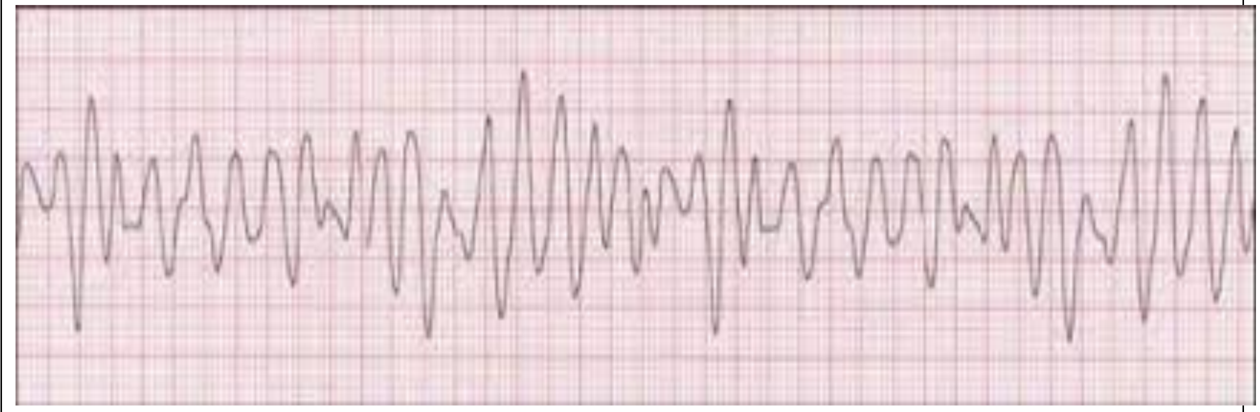
Table 4.2.1: Distribution of ER nurses' responses to questions regarding level of competency about ECG interpretation (Accurate answers are in ***bold italic***, missing answers are considered inaccurate, ER = Emergency Room, ECG = Electrocardiogram)

Question and answers	**Frequency**	**Percentage**
1. What is the correct order of EKG waves and intervals?		
a) P wave, PR interval, QRS complex, ST interval, T wave, U wave	***153***	***78.1%***
b) T wave, P wave, QRS complex, PR interval, ST interval, U wave	16	7.6%
c) QRS complex, P wave, PR interval, T wave, ST interval, U wave	19	9.7%
d) I do not know	9	4.6%
2. If in an EKG the p wave does not appear, what is your first thought?		
a) There is a conduction problem between the ventricles	24	12.2%
b) There is a conduction problem between the atriums	***142***	***72.4%***
c) It is normal, it does not have to appear in an EKG	16	8.2%
d) I do not know	14	7.1%
3. You perform an EKG and observe this register. What do you think it might be?		

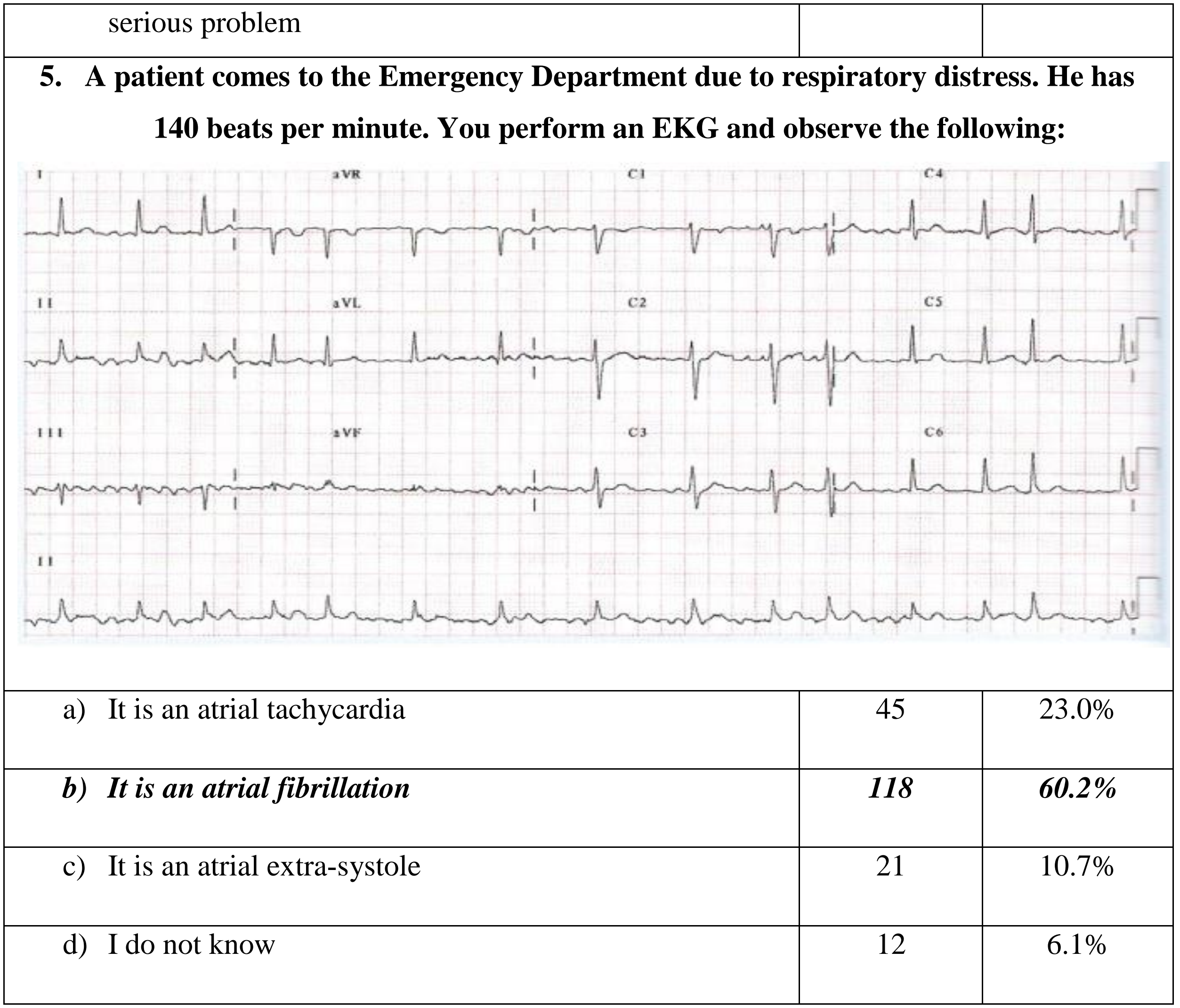


a) A third-degree heart block	24	12.2%
b) An atrial flutter	***133***	***67.9%***
c) A supra-ventricular tachycardia	24	12.2%
d) I do not know	15	7.6%

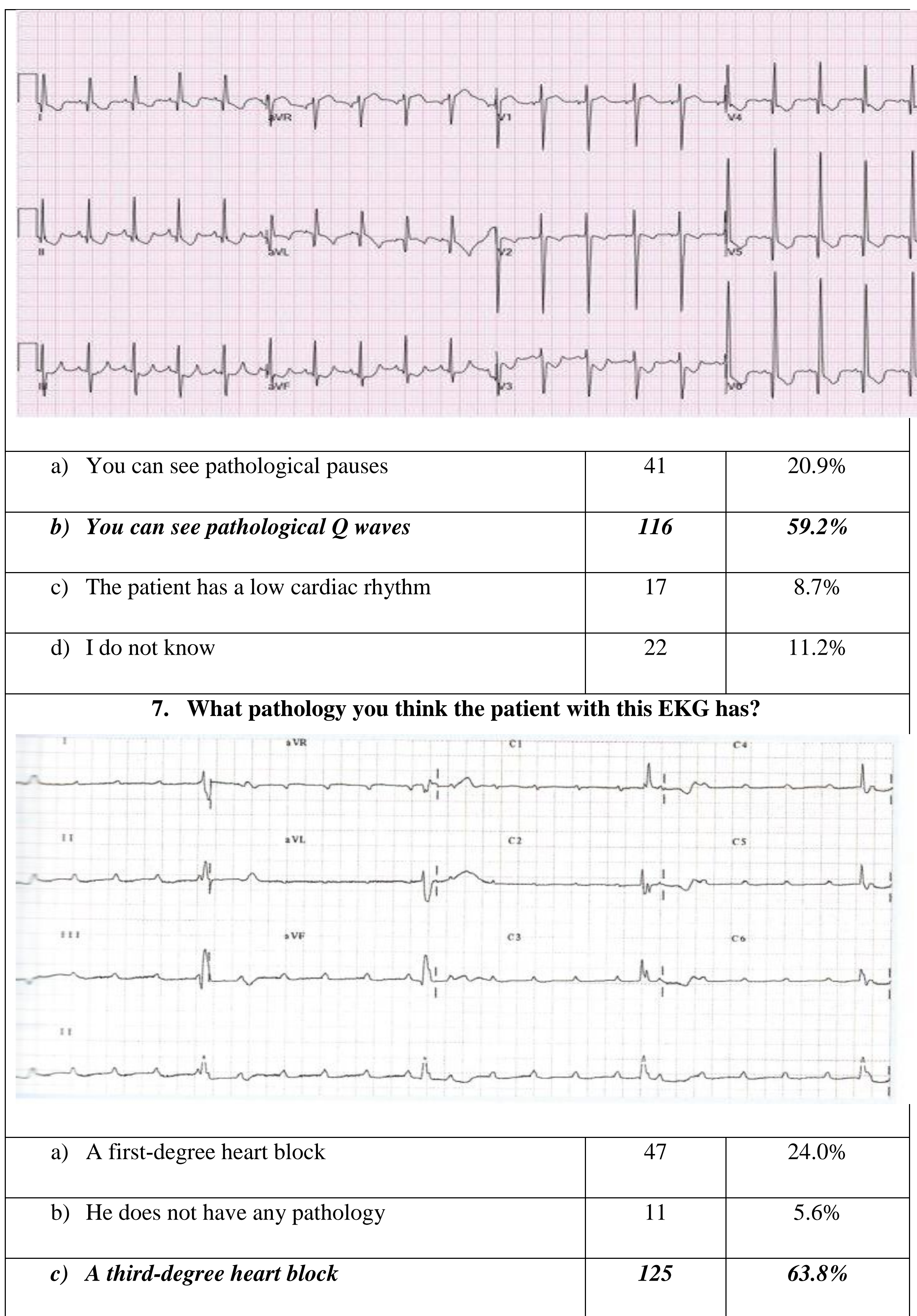
4. You perform an EKG and observe this register. How would you act?



a) Ask for help without leaving the patient alone because it is a ventricular fibrillation	***143***	***73.0%***
b) Ask for help without leaving the patient alone because it is an atrial fibrillation	30	15.3%
c) Perform another EKG because it looks like there may be interference	14	7.1%
d) You do not know how to act but you know it must be a	9	4.6%

serious problem		
5. A patient comes to the Emergency Department due to respiratory distress. He has 140 beats per minute. You perform an EKG and observe the following: 		
a) It is an atrial tachycardia	45	23.0%
b) It is an atrial fibrillation	***118***	***60.2%***
c) It is an atrial extra-systole	21	10.7%
d) I do not know	12	6.1%

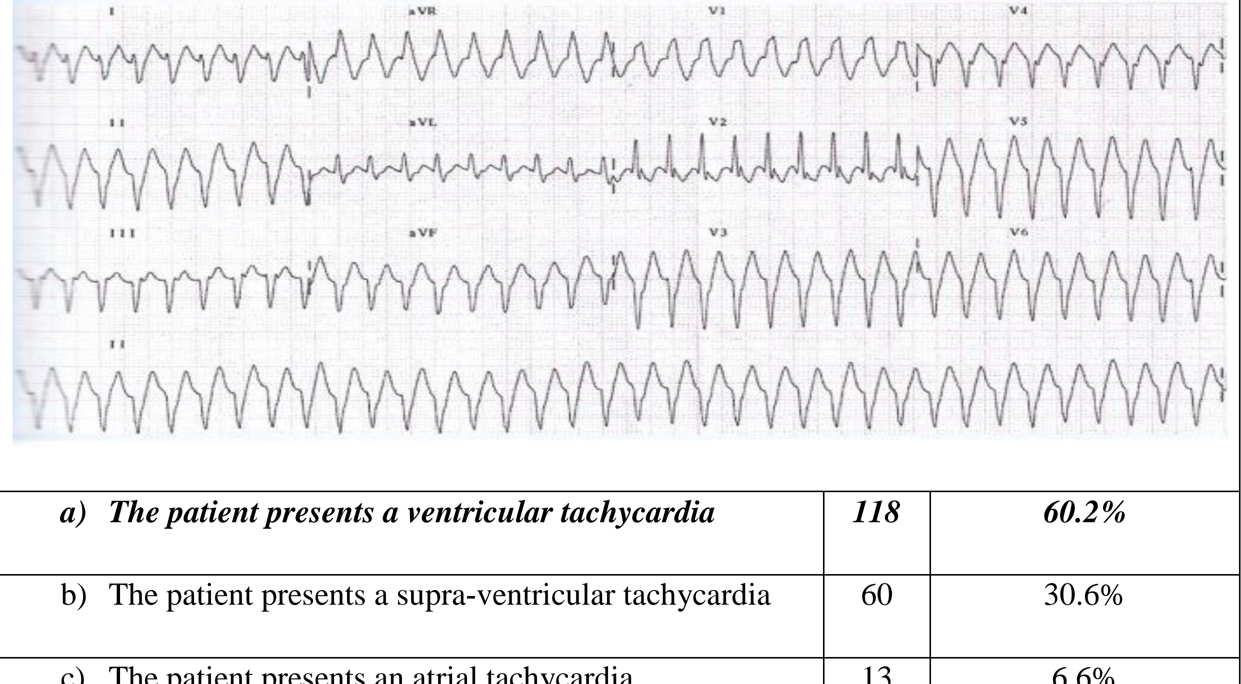
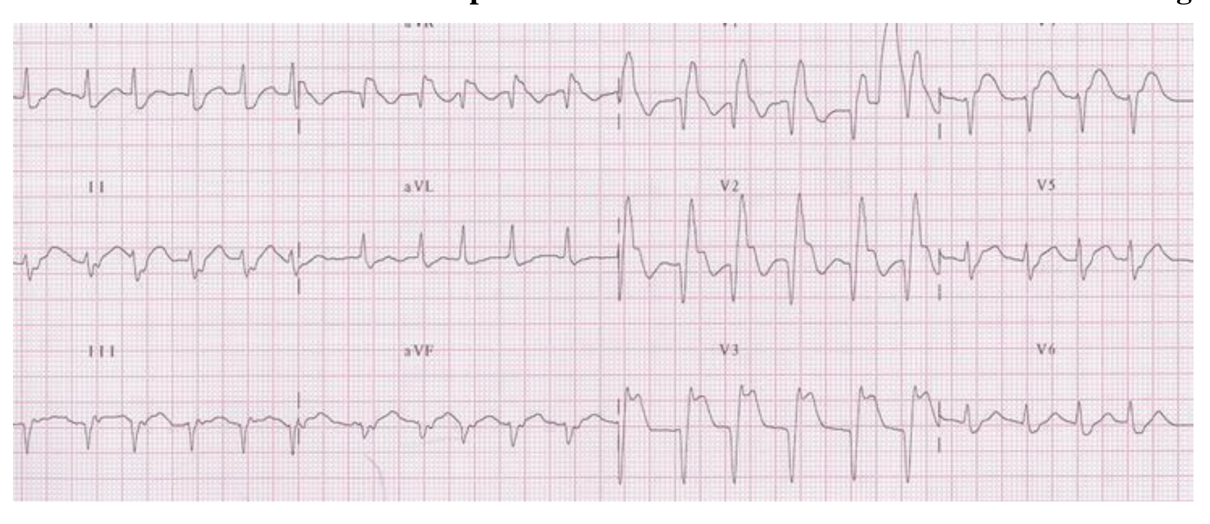
6. A patient comes to the Emergency Department with precordial pain for more than 8 hours. You perform a 12-branch EKG. After observing the EKG, what catches your attention?

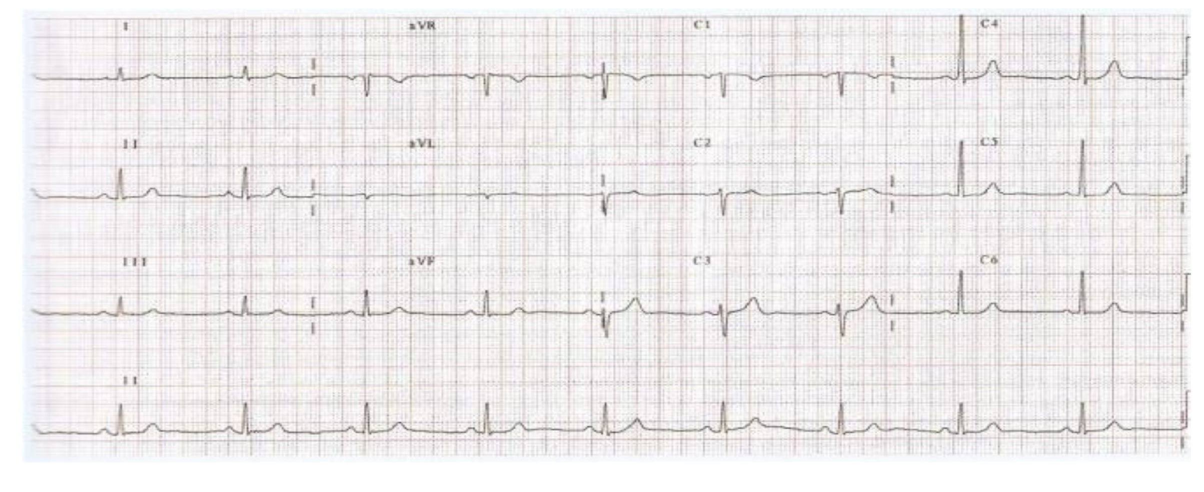


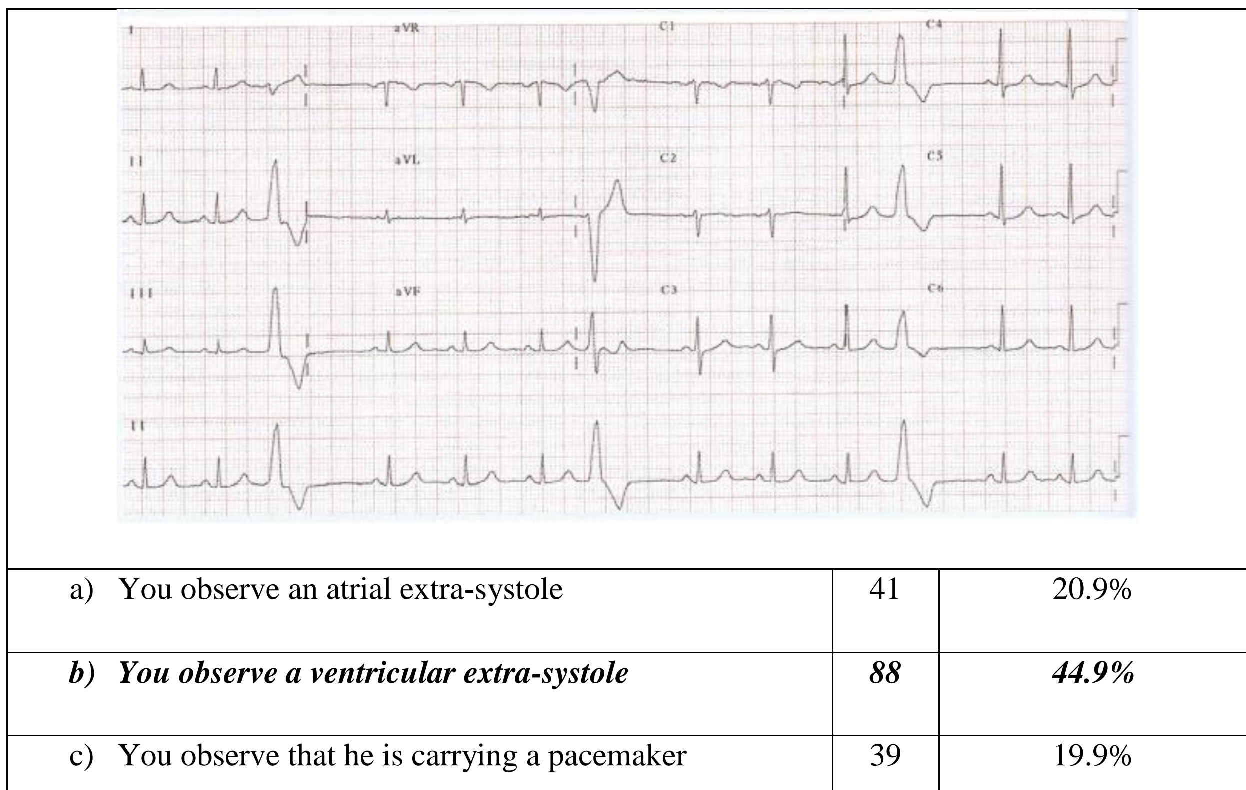
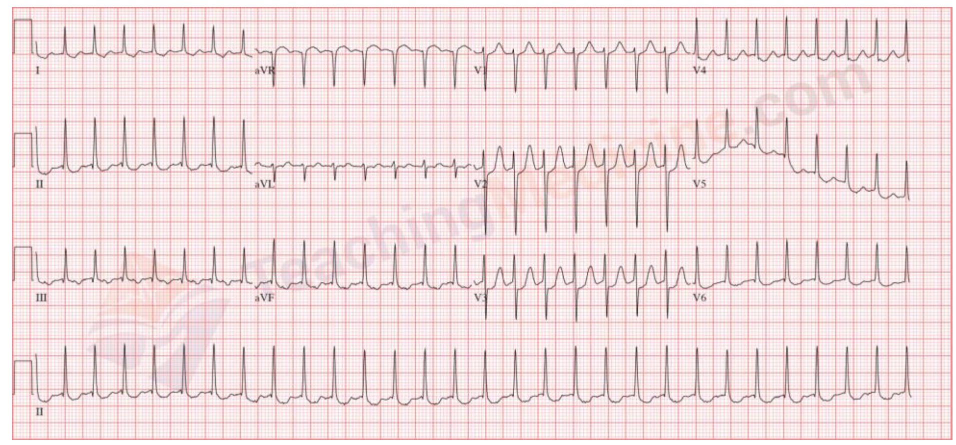
a) You can see pathological pauses	41	20.9%
b) You can see pathological Q waves	***116***	***59.2%***
c) The patient has a low cardiac rhythm	17	8.7%
d) I do not know	22	11.2%

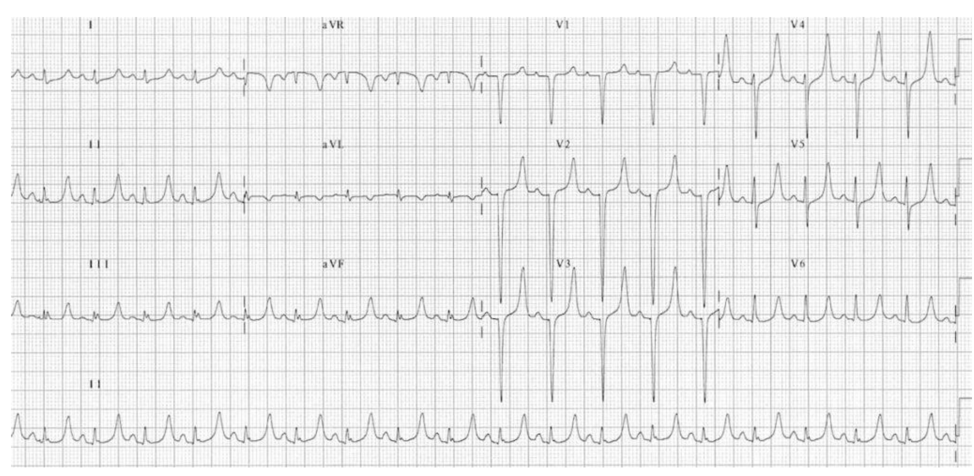
7. What pathology you think the patient with this EKG has?

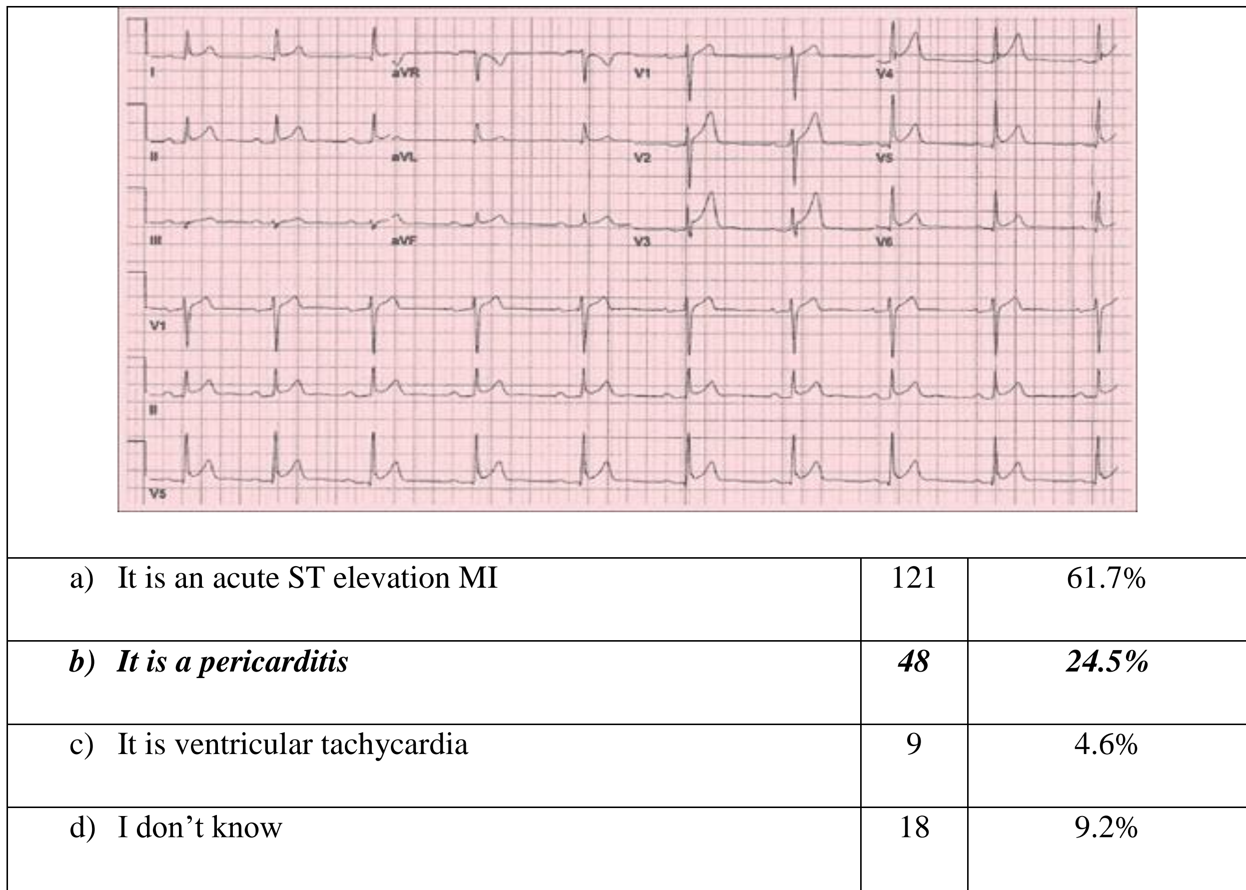
a) A first-degree heart block	47	24.0%
b) He does not have any pathology	11	5.6%
c) A third-degree heart block	***125***	***63.8%***

d) I do not know.	13	6.6%
8. A hospitalized patient who had had surgery due to an acute MI is transferred to the Emergency Department to be monitored because his vital signs are unstable. You perform an EKG and observe the following: 		
a) The patient presents a ventricular tachycardia	***118***	***60.2%***
b) The patient presents a supra-ventricular tachycardia	60	30.6%
c) The patient presents an atrial tachycardia	13	6.6%
d) I do not know	5	2.6%
9. You are in triage and call a patient who reports medium-intensity precordial pain. He tells you that the pain appeared after leaving an important meeting two hours ago. He is 52 years of age and hypertensive and a few months ago he was diagnosed with Diabetes Mellitus II. You perform a 12-branch EKG and observe the following: 		

a) It is a supra-ventricular tachycardia	20	10.2%
b) It is an acute myocardial infarction	98	50.0%
c) It is an acute myocardial infarction with a pathological Q wave	***63***	***32.1%***
d) I do not know.	15	7.7%
10. A 24-year-old male comes to the Emergency Department He is athletic and slim. He reports feeling a pricking sensation in the left area of his chest since he finished doing exercise (3 hours earlier). You perform an EKG and observe the following: 		
a) It is an atrial bradycardia	57	29.1%
b) He has conduction problems	32	16.3%
c) It is a normal EKG	***97***	***49.5%***
d) I do not know	10	5.1%
11. **A patient with digitalis intoxication comes from a hospitalization ward. Before monitoring him, you perform an EKG and obtain the following:**		

<table>
<tr><td colspan="3">
</td></tr>
<tr><td>a) You observe an atrial extra-systole</td><td>41</td><td>20.9%</td></tr>
<tr><td>b) You observe a ventricular extra-systole</td><td>88</td><td>44.9%</td></tr>
<tr><td>c) You observe that he is carrying a pacemaker</td><td>39</td><td>19.9%</td></tr>
<tr><td>d) I do not know</td><td>28</td><td>14.3%</td></tr>
<tr><td colspan="3">12. A 30-year-old woman comes to the Emergency Department reporting palpitations, chest tightness and dyspnea. You perform an EKG and observe the following:

</td></tr>
<tr><td>a) It is a ventricular tachycardia</td><td>18</td><td>9.2%</td></tr>
<tr><td>b) It is an atrial extra-systole</td><td>20</td><td>10.2%</td></tr>
<tr><td>c) It is a supra-ventricular tachycardia (SVT)</td><td>143</td><td>73.0%</td></tr>
<tr><td>d) I do not know</td><td>15</td><td>7.6%</td></tr>
</table>

13. **As an emergency nurse, what is the first step you do with person have confirmed asystole:**		
a) Activate emergency response team and start high quality CPR	***145***	***74.0%***
b) Apply IV/ IO access then activate emergency response team	21	10.7%
c) Inform Dr and apply IV access	15	7.7%
d) Inform emergency response team then give DC shock	15	7.7%
14. A male patient comes to emergency department complaining of general weakness and decreased urinary output. You perform an EKG and observe the following: 		
a) It is a pathological Q wave and inform Dr	31	15.8%
b) It is a hyperkalemia and start management immediately	***119***	***60.7%***
c) It is a normal EKG	13	6.6%
d) I don't know	33	16.8%
15. A young patient comes to the emergency department complaining of chest pain. You perform an EKG and observe this:		



a) It is an acute ST elevation MI	121	61.7%
b) It is a pericarditis	***48***	***24.5%***
c) It is ventricular tachycardia	9	4.6%
d) I don't know	18	9.2%

Figure 4.2.1 distributes the frequencies of the correct answers for each of the 15 questions in the level of competency section regarding ECG interpretation. On the other hand, Figure 4.2.2 distributes the frequency for each number of correct answers out of 15, indicating the number of nurses who answered specific correct answers out of 15, which is considered to be the indicator for the level of competency about ECG interpretation. The mean number of correct answers among the sampled ER nurses was 9.107 ± 3.537 out of 15, which indicated that the mean level of competency among the ER nurses about ECG interpretation is 60.714%, which is fairly a split above the satisfying level of competency (above 60%), ranging from zero to 15 correct answers. Table 4.2.3 distributes the frequencies and percentages of the competency level among the ER nurses regarding ECG interpretation. The table shows that there is an approximate distribution among levels of competency regarding ECG interpretation, where 38.8% of the nurses had poor, 29.6% had acceptable and 31.6% had excellent levels of competency.

Figure 4.2.1: Distribution of the correct and wrong answers for each question

Question	Correct	Wrong
Pericarditis	24.5%	75.5%
Hyperkalemia recognition	60.7%	39.3%
Asystole emergency management	74.0%	26.0%
Supraventricular tachycardia	73.0%	27.0%
Ventricular extra-systole	44.9%	55.1%
Normal ECG	49.5%	50.5%
MI with pathological Q wave	49.5%	50.5%
Ventricular tachycardia	60.2%	39.8%
3rd-degree heart block	63.8%	36.2%
Pathological Q wave	59.2%	40.8%
Atrial fibrillation	60.2%	39.8%
Ventricular fibrillation	73.0%	27.0%
Atrial flutter	67.9%	32.1%
P-wave absence interpretation	72.4%	27.6%
ECG waves order	78.1%	21.9%

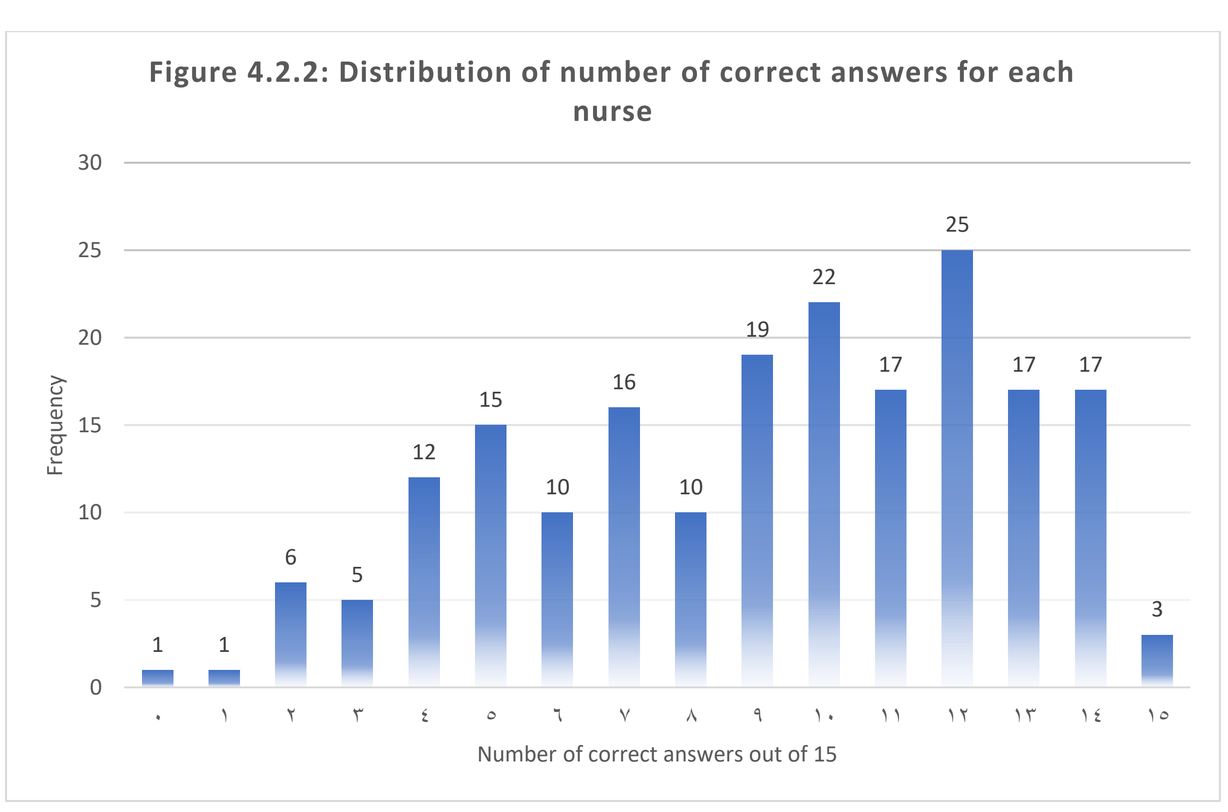


Figure 4.2.2: Distribution of number of correct answers for each nurse

Table 4.2.3: Distribution of level of competency levels among ER nurses regarding ECG interpretation

Competency level	**Frequency**	**Percentage**
Poor level of competency (< 60%)	76	38.8%
Good level of competency (60% - < 80%)	58	29.6%
Excellent level of competency (80% and higher)	62	31.6%

4.3 Analytical results

This part investigates the relationship between ER nurses' sociodemographic factors and their level of competency, in order to test the study's hypothesis, where the nurses' sociodemographic data are considered the independent variables, while the level of competency, indicated by the number of correct answers, is the dependent variable.

Table 4.3.1 shows the analytical tests' results regarding the relationship between ER nurses' sociodemographic factors and their level of competency. It shows that older nurses have higher level of competency (mean = 10.3 for 40 years and older compared to 9.15 for 20 – 29 years old), but in an insignificant way (p-value = 0.554), and the same is found in the Spearman Correlation test, which gave a weak result of 0.075 (p-value = 0.326), with male nurses (mean = 9.26) had insignificantly higher level of competency than female nurses (mean = 8.72, p-value = 0.392).

On the other hand, educational level of the nurse was significantly correlated with his/her level of competency regarding ECG interpretation, with higher level of competency with higher education (mean = 11.39) compared to bachelor's (mean = 9.63) and diploma (mean = 6.47) degrees (p-value < 0.001). Although, both hospital type (p-value = 0.150) and district (p-value = 0.054) had no significant relationship with the level of competency, and the same surprisingly applies for the relationship between experience years in ER and level of competency (p-value = 0.134), while more experienced ER nurses had higher mean competency scores, but insignificantly.

As expected, receiving courses related to ECG interpretation was significantly correlated with higher level of competency (p-value = 0.045), and while the period since the last course was not significantly correlated with the level of competency (p-value = 0.657), results showed that nurses who received the ECG interpretation courses via face-to-face

method (mean = 10.43) were significantly more competent than who received it partially face-to-face (mean = 8.73) or via online method (mean = 7.58, p-value = 0.014). Also, nurses who received the courses for more than 20 hours had significantly higher level of competency (mean = 11.67, p-value < 0.001).

Moreover, ER nurses who received BLS and ACLS courses had significantly higher competency level (mean = 9.58 and 9.68, respectively) than who did not (mean = 7.64 and 8.45, respectively), which are accredited by AHA (p-value = 0.003 and 0.016, respectively). Finally, ER nurses who are exposed to more ECG interpretation times in their duty are more competent (p-value = 0.001).

Table 4.3.1: Differences in mean score of competency (out of 15) about ECG interpretation according to ER nurses' sociodemographic data

Variable	**Values**	**Mean**	**Test value**	**p-value**
Nurse's age (in complete years)	20 – 29 years old	9.15	2.025	0.554
	30 – 39 years old	8.78		
	40 years and older	10.30		
	Spearman Correlation		0.075	0.326
Gender	Male	9.26	3654.0	0.392
	Female	8.72		
Educational level	Diploma degree	6.47	36.748	< 0.001***
	Bachelor's degree	9.63		
	Higher educations	11.39		
Hospital type	Governmental hospital	8.99	1485.5	0.150

	Private hospital	10.04		
District	Northern West Bank	9.59	5.851	0.054
	Middle West Bank	9.36		
	Southern West Bank	8.42		
Experience in emergency room (ER)	< 1 year	8.06	7.026	0.134
	1 – 5 years	9.09		
	6 – 10 years	9.13		
	11 – 20 years	10.00		
	> 20 years	12.00		
Did you do any training course about electrocardiography?	No	8.46	3806.5	0.045*
	Yes	9.52		
If "Yes", When was the last course?	≤ 1 year	9.44	0.839	0.657
	2 – 5 years	10.02		
	> 5 years	9.76		
If "Yes", How was the course taken?	Online	7.58	8.497	0.014*
	Face-to-face	10.43		
	Partial face-to-face	8.73		
If "Yes", How many hours was the course?	< 10 hours	10.40	15.714	< 0.001***
	10 - 20 hours	7.66		
	> 20 hours	11.67		
Do you have a BLS course accredited from AHA?	Yes	9.58	2548.0	0.003**
	No	7.64		

Do you have an ACLS course accredited from AHA?	Yes	9.68	3828.5	0.016*
	No	8.45		
Number of ECG interpretation exposure daily	0 – 5 times	8.65	19.563	0.001**
	6 – 10 times	8.11		
	11 – 20 times	10.10		
	> 20 times	10.66		

Significance marked as * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001. Test values are for Mann-Whitney U test for mean differences according to gender, hospital type, receiving ECG training, receiving BLS or ACLS, while for Kruskal-Wallis for differences in mean according to age group, educational level, district, ER experience, ECG course details and exposure.

For the significantly correlated relationships, a post hoc test was conducted to investigate the significance in the difference between each individual value of the independent variables.

Table 4.3.2 shows the results regarding the post hoc using Tukey equation following Kruskal-Wallis test with significant results. It shows that for the relationship between educational level and the level of competency, no significant difference was found between nurses with bachelor's and master's degrees (p-value = 0.060), while the significant differences were found between diploma degree nurses and both bachelor's and master's degree nurses (p-value < 0.001).

Moreover, for the nurses who took a previous ECG course, no significant difference was found in the level of competency between nurses who took the course via partial face-to-face method and both online (p-value = 1.000) and face-to-face (p-value = 0.368) methods,

while the significant difference in competency was between nurses who took the course via online method and face-to-face (p-value = 0.022). Also, no significant difference in the level of competency was found between nurses who took an ECG course of less than 10 hours or more than 20 hours (p-value = 0.903), while the significant difference was found between the nurses who took the course for 10 – 20 hours and both of less than 20 hours (p-value = 0.001) and more than 20 hours (p-value = 0.007).

Lastly, among nurses with different exposure times to ECG interpretation in their duty, nurses who were exposed to 5 – 10 times had significant difference than nurses who were exposed for 10 – 20 times (p-value = 0.033) and more than 20 times (p-value = 0.003), and between nurses who were exposed for 0 – 5 times and who were exposed for more than 20 times (p-value = 0.030).

Table 4.3.2: Post hoc test (Tukey) for the significantly different level of competency means about ECG interpretation according to ER nurses' sociodemographic factors.

Independent variable	**Independent values**	**p-value**
Educational level	Diploma vs. Bachelor's	< 0.001***
	Diploma vs. Master	< 0.001***
	Bachelor's vs. master	0.060
How the ECG course was taken (For nurses who took an ECG course)	Online vs. Partial face-to-face	1.000
	Online vs. Face-to-face	0.022*
	Face-to-face vs. Partial face-to-face	0.368
ECG course duration (For nurses who took an ECG	< 10 hours vs. 10 – 20 hours	0.001**
	10 – 20 hours vs. > 20 hours	0.007**

course)	< 10 hours vs. > 20 hours	0.903
ECG interpretation exposure	0 – 5 times vs. 5 – 10 times	1.000
	5 – 10 times vs. 10 – 20 times	0.033*
	5 – 10 times vs. > 20 times	0.003**
	0 – 5 times vs. 10 – 20 times	0.218
	0 – 5 times vs. > 20 times	0.030*
	10 – 20 times vs. > 20 times	1.000

*Significance marked as * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001.*

To determine the predictors of the competency level among the ER nurses, a linear regression was conducted between significantly associated demographic factors and the competency level, as shown in Table 4.3.3. It shows that the nurse's educational level is considered a significant positive predictor (p-value < 0.001), where each level increased in nurse's education (e.g. from bachelor's to higher education) is predicted to increase level of competency by 2.615 out of 15 (95% CI = 1.834 – 3.396). Also, receiving a course in ECG interpretation was positively predicted to increase the competency level by 1.053 out of 15 (95% CI = 0.041 – 2.066, p-value = 0.041), although both course type and hours of ECG were not predictors for competency level (p-value = 0.103 and 0.252, respectively).

On the other hand, receiving accredited courses from AHA (BLS and ACLS) were significantly predicted to increase competency level by 1.935 (95% CI = 0.806 – 3.064, p-value = 0.001) and 1.226 (95% CI = 0.240 – 2.212, p-value = 0.015) out of 15, respectively. Lastly, more exposure to ECG interpretations per day was also a significant positive predictor (p-value < 0.001), where an increase of exposures by 5 times per day (each categorized level of exposure) is predicted to increase competency level by 0.842 out of 15 (95% CI = 0.385 – 1.300).

Table 4.3.3: Predictors of competency level among ER nurses

Factor	Coefficient (B)	95% CI B	t value	p-value
Educational level	2.615	1.834 – 3.396	6.605	< 0.001***
Received ECG training course	1.053	0.041 – 2.066	2.053	0.041*
ECG course type	1.016	- 0.208 – 2.241	1.646	0.103
ECG course hours	- 0.590	- 1.605 – 0.426	- 1.152	0.252
Received BLS course	1.935	0.806 – 3.064	3.380	0.001**
Received ACLS course	1.226	0.240 – 2.212	2.452	0.015*
ECG exposure	0.842	0.385 – 1.300	3.629	< 0.001***

Significance marked as * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001.

CI = Confidence interval.

4.4 Summary

In the current study, we sampled 196 nurses in ERs, with a mean age of 29.12 years old, mostly males (70.9%), and with a bachelor's degree in nursing (65.3%), working in governmental hospitals (89.3%), approximately distributed between the three districts of West Bank. Of them, 46.9% had an experience of 1 – 5 years in ER, and 60.7% reported receiving previous ECG training courses. Also, 75.5% of the nurses received an accredited BLS course, compared to 53.1% for ACLS course.

The percentage of correct answers regarding question about ECG interpretation ranged from 24.5% and 78.1%, with a mean score of 9.107 of correct answers out of 15 questions, resulting in a fair satisfaction level (60.714%) of competency, with 31.6% of them having an excellent level of 80% or higher of correct answers.

Higher level of competency was significantly related to higher level of education (p-value < 0.001), receiving an ECG course (p-value $= 0.045$) via face-to-face method (p-value $= 0.014$) for longer duration (p-value < 0.001), and with receiving accredited BLS (p-value $= 0.003$) and ACLS (p-value $= 0.016$) courses, and higher exposure to ECG interpretations per day (p-value $= 0.001$). Also, higher competency level was predicted by higher educational level, receiving ECG courses, BLS and ACLS, and more ECG interpretation exposure.

Chapter Five:

Discussion, Recommendation, and Conclusion

5.1 Introduction

This chapter provides a discussion for the current study's results, by comparing them to the results of previous articles, as well as providing a critical overview from the researcher's point of view.

5.2 Discussion

The current study recruited a number of 196 emergency nurses from a variety of hospitals in almost all emergency departments of major West Bank hospitals in Palestine, which is a suitable sample size, as it is compliant with the requirement of a quantitative descriptive cross-sectional design, and it exceeded the minimum required sample size (as calculated by G*Power software) by 33.3%. Also, the total number of targeted nurses was 226 in the emergency rooms, which gives a response rate of 86.7%, and is considered acceptable, according to several related references, which state that a response rate of more than 50% for social sciences studies is acceptable, and a response rate of higher than 80% is considered very good (Saldivar, 2012), while other studies stated that the mere response rate is not important is much as the achievement of the required sample size (Carley-Baxter et al., 2009).

The used questionnaire to collect data about the ER nurses' level of competency regarding ECG interpretation started with close-ended questions about their sociodemographic and professional data, and the current questionnaire tried to cover the most important factors that may affect the study's outcome (ECG interpretation competency). Therefore, the first part asked about specific experience in ER, and whether the nurse took specific courses related to ECG, as well as details related to such courses, because they vary from an educational institution to another in terms of duration and type of courses, while other specific questions

were related to the BLS and ACLS courses, which are provided internationally by AHA and are the adopted courses for life support in general, and ECG interpretation and management in specific, in the Palestinian hospitals. Results showed that more than three fourths of nurses (75.5%) took the BLS course and more than half of them took the ACLS course, which are acceptable, but it is worth taking in consideration that such courses are not mandatory, but recommended, in the targeted hospitals, in opposite to what is found in some private accredited and teaching hospitals, as well as the fact that the current questionnaire did not ask about the duration since the last BLS or ACLS course taken, because they are valid for 2 years only, but the study was concerned about whether the nurse has the appropriate background for ECG interpretation and arrhythmia management from a well-known evidence-based source.

The second part of the questionnaire included 15 questions related to ECG waves interpretation and management, and was originally adopted from Coll-Badell et al. (2017), who included 12 questions in the original questionnaire, but was contacted to have the permission to add other arrhythmias and management-related questions. The questions were reviewed by specialist doctors and other clinicians, and provided an overall positive feedback about the construct and consistency of competency part. The ECG patterns that were covered in the current study's questionnaire reflected a variety in their complexity and frequency, and therefore it gives the competency part more consistency in its measurement of ECG interpretation and management. Also, ECG interpretation competency part was supported by providing the nurses with clear and colored ECG strips to identify the pattern, which allowed for higher level of accuracy and avoiding misinterpreted arrhythmias.

Previous studies, such as the cross-sectional study of Ndung'u et al. (2022), found an interesting result regarding the comparison between ECG-specific level of competency and the overall competency level among ER nurses, which stated that nurses tend to perceived a higher self-rated competency in ECG area compared to the overall competency, either in all

levels and in the advanced level. This can be related to the relative higher exposure of ER nurses to ECG interpretation compared to the rest of the departments, which gives the ER nurses more trust in their capabilities to interpret and manage ECG cases. Also, the previous study focused on the educational needs, as perceived by the nurses, which is an important initial step in providing the most suitable educational sessions to the nurses, that is starting with assessing nurses' perceived needs, as well as assessing the different needs in different departments.

In the beginning, the review of Haristiani and Tanrewali (2021) goes parallel with the conclusion of the current study conclusion in its review of literature, in which the competency level among ER nurses regarding ECG interpretation is variant in different settings, sample sizes, demographic factors of the nurses, especially their educational level, experience and exposure to ECG interpretations per day. These factors were also studied in the current study, which gives it an advantage in terms of trying to cover the most possible factors that may play a role in nurses' competency level. The competency level among ER nurses in the current study was satisfying and above in 61.2% of the participants, which is also in the range of the competency level found by the review. On the other hand, the previously mentioned review has a limitation in that it mainly included cross-sectional studies, and therefore, further reviews and meta-analyses are recommended to be conducted on more rigorous studies, which focus on the comparison in ER nurses' competency levels before and after providing a given educational session (experimental studies).

The study of Aljohani (2022) has the similarity in investigating the overall order of nurses' correct identification of ECG arrhythmias, where it was asystole, followed by ventricular tachycardia, normal sinus rhythm and sinus bradycardia, while in the current study, the order was ventricular fibrillation and supra-ventricular tachycardia (73.0% each), followed by atrial flutter (67.9%) and ventricular tachycardia and atrial fibrillation (60.2% each), while

the least correctly identified arrhythmias in the previous study were atrial fibrillation, followed by ventricular fibrillation and atrial flutter, compared to pericarditis (24.5%), ventricular extra-systole (44.9%) and normal ECG (49.5%). The differences may be mainly related to the difference in nurses' characteristics between both studies, where it contained ER nurses in the current study, compared to a variety of critical care nurses (around one fourth of them from ER) in the previous study, and therefore, there is a difference in the exposure of nurses to specific ECG arrhythmias between coronary care units, ER and general ICU departments. On the other hand, the overall level of competency was 6.45 out of 10 (64.5%) in the previous study, compared to 60.714% in the current study, which is insignificantly lower, and can be related to containing other questions related to specific management to ECG arrhythmias in the current study, while the previous study investigated for ECG arrhythmias only. Lastly, the previous study found that higher competency level was found among nurses with higher educational levels and who took previous courses, which is consistent with the current study, while no significant relationship between their experience and competency level was found in the previous study, which was also consistent with the current study, which indirectly supports the idea that experience merely is not associated with higher competency, but the more important factor is receiving courses and continuous education.

The study of Coll-Badell et al. (2017) was the basis in adoption of its questionnaire and modifying it for the purpose of ECG competency investigation in the current study. On the other hand, there are some differences between both studies that led to expected differences in the results. First, the response rate of the previous study (47.2%) was noticeably lower than in the current study (86.7%), which is also parallel with the lower sample size (57 vs. 196). Also, the mean age of the nurses was 40.5 years old in the previous study compared to 29.12 years old in the current study, which may be related to differences in ER nurses' characteristics between Palestinian and Spanish areas. The previous study also found that the

mean score for ER nurses regarding ECG interpretation was 8.6 out of 10 (86%), with more than 75% found in 93% of them, compared to 60.714% in the current study, with 31.6% having 80% and more. The difference may be mainly related to the huge difference in response rate, and therefore, studies with lower response rate may have false representation of the overall nurses' competency, because only nurses with high competency may have answered the questionnaires, and nurses who found themselves unable to identify ECG arrhythmias left the participation, which gives the current study an advantage over the previous one. Lastly, both studies found a similar positive relationship between taking previous ECG courses and level of competency, which supports the positive effect of continuous education on the competency level.

The study of Rahimpour et al. (2021) highlighted an important issue regarding the necessity to compare ECG interpretation competency among different HCPs, even inside the ER itself, and although this previous study may not be applicable in the Palestinian community because in most hospitals there are no EMS specified personnel in their emergency rooms, the findings that nurses have a satisfying level of competency (6.65 out of 10) compared to EMS (4.87 out of 10) who had unsatisfying competency, it is recommended to guide more effort towards EMS and ambulance health workers to increase their competency in ECG interpretation because they are the first health care workers to receive and transport critically ill patients. Increased level of awareness among EMS personnel is associated with decreased complication that may happen during transportation, i.e., improved pre-hospital care (Langabeer et al., 2014). The previous findings are also supported by the results of the study of Werner et al. (2016), who stated that the overall level of competency among ambulance nurses about ECG interpretation is weak (54%), with a low recognition of MI (as one of the most common cases, 46%).

The Turkish study of Tahboub and Yılmaz (2019) found an approximate mean level of competency regarding ECG interpretation with the current study (67% vs. 60.714%, respectively), despite the differences in the used questionnaire and the distribution of Bachelor's degree nurses' proportion (93.8% vs. 65.3%, respectively). This difference may interpret the higher level of competency among Turkish nurses, as well as the diversity in the recruited departments in the Turkish study, compared to ER only in the current study. Furthermore, the previous study found a positive relationship between nurse's experience and level of competency, which is insignificant in the current study (p-value = 0.134).

The cross-sectional study of Qaddumi et al. (2019) has the advantages of comparing governmental and non-governmental hospital nurses in their competency level, as well as its inclusion of lethal and non-lethal ECG arrhythmias, which was also applied in the current study, and the number of nurses from each hospital type is approximate (154 and 146, respectively, which was opposite to what is in the current study, and despite that the mean level of competency was higher among private (10.04) than governmental (8.99) hospital nurses in the current study, the difference was insignificant (p-value = 0.150), and this was not the case in the previous study, where governmental hospital nurses had significantly different levels of competency than private hospital nurses in terms of arrhythmia analysis and interpreting parameters, and the difference can be related to the fact that the percentage of governmental nurses in the current study is much higher than in private hospital nurses (89.3% and 10.7%, respectively). It is recommended, therefore, to try to control the hospital type variable in the future studies in terms of comparing competency levels, which will help in gathering more realistic overview of the differences in competency that is based on the trends of continuous education plans that are found in each type of hospitals. On the other hand, the previous study was conducted in Nablus city only, while the current study expanded the sampling to contain all areas of West Bank – Palestine.

The difference in the inclusion criteria of the studies may have the major role in the differences in levels of competency that are found between studies, a good example is the differences between the current study findings and the previous study of Ruhwanya et al. (2018), who included nurses from a variety of critical care departments, compared to ER nurses only in the current study, and therefore, the difference can be interpreted. Also, the previous study has different nurses' distribution according to their age groups, where 44% of them were between 31 and 40 years old, compared 60.2% of the nurses were between 20 and 29 years old in the current study. These differences may lead to the differences in competency level regarding ECG interpretation, where it was noticeably weak in the previous study (84.4% had poor scores, compared to only 38.8% in the current study), as 38.3% of them were able to identify heart block rhythm, compared to 63.8% in the current study. On the other hand, the previous study has the advantage on including questions about nurses' perceived barriers that may hinder their increasing of competency, which was overwhelming workload (68.8%) in the first place, and is recommended to be added in future studies in this area, because it helps in guiding continuous education efforts to a more suitable trajectory.

Adding to the previous comparison, the study of Venkatesan (2022) had only 30 ER nurses in their sample, compared to 196 in the current study, while they had similarities in that majority of nurses were young and having bachelor's degree, but it showed noticeably lower level of competency about ECG interpretation (46.6% inadequate and 53.3% acceptable) than in the current study (38.8% poor and 61.2% acceptable and above). Also, sample differences led to differences in relationships, where the previous study showed no significant relationship between nurses' demographic factors and their level of competency (gender, educational level, experience and perceived skills), while the current study showed significantly higher competency level among nurses with higher educational level, experience and ECG courses, with no significant relationship between their gender and competency level. The main

conclusion in this comparison is the recruitment of enough sample size to such comparative quantitative studies.

Among the reviewed literature, only one study conducted a regression analysis predicting the competency of ECG interpretation (Amini et al., 2022). The study found that similar findings in hat educational level is a predictor for higher competency ($B = 0.554$, p-value = 0.003), which is similar to the current study ($B = 2.615$, p-value < 0.001). On the other hand, the previous study was in opposite with the current study in that experience and hospital type predicted the competency level, which was not found in the current study, which may be related to differences in classification system of hospitals between the two settings. Also, the previous study included students rather than merely registered nurses in their sample.

The studies that aimed to investigate the effect of educational sessions on the level of competency and competency about ECG interpretation emphasizes the essential point of the important tole of continuous education. First, the study of Zhang and Hsu (2013) agreed with other studies that there is a difference in the basic level of competency about ECG interpretation between nurses from different departments, and therefore, it is important to assess the competency level before starting educational sessions so the efforts of education are well-guided. Moreover, different teaching techniques should be involved in continuous education, which is not just showing promising results, as seen in the previous study of Habibzadeh et al. (2019), but is also more suitable for the new generations of nurses, especially newly graduated, which simulates their daily habits of high-tech devices that they use. It is also worth mentioning that educational sessions are beneficial in general, as found in the previous study, because both traditional and virtual methods showed significantly increased posttest results.

On the other hand, the adoption of new technologies in the teaching process of ECG interpretation needs ongoing monitoring of their effects, as well as the necessity of conducting them by a trained personnel, which is noticed in the previous study of Fent et al. (2016), who found that there was no difference between traditional and ECG simulating methods. The previous study had no pretest assessment of ECG interpretation skills, which is a weakness point in it, and emphasizes on the previously mentioned point that pre-educational sessions assessment is essential, as it guides the educational effort efficiently. Moreover, the previous study highlighted a good point regarding the possible limitations and barriers that educators may face, in terms of training the trainers and the needed number of sessions.

While the Egyptian study of Weheida et al. (2016) had the strength of comparing patients' outcomes as affected by the increased competency of nurses' ECG interpretation, rather than nurses' outcomes only, it has two main disadvantages, which were the complex misunderstood analytical approaches, and that patient outcomes are indirectly affected by educational sessions for nurses, and several factors play a role in them. Also, the study was not published in a well-known international journal, but it was worth mentioning in the review.

Studies that were related to the education about ECG interpretation among different HCPs, especially ER nurses, support the result of the current study related to the significantly more competent nurses who took previous courses in ECG interpretation and life support. Also, educational sessions and courses should be regulated in a high efficiency way, such as focusing on classifying the needs of ER nurses, as investigated by Hoang et al. (2021) and Keough et al. (2016) as well as trying to cover as much ECG-related issues as possible, as seen in the study of Antiperovitch et al. (2018).

5.3 Conclusion

The current study aimed to investigate the competency level among a sample of 196 ER nurses in governmental and non-governmental hospitals in West Bank – Palestine, and utilized an ECG competency questionnaire from a previous study.

Main results showed that 65.3% of the nurses hold bachelor's degree in nursing, with 46.9% having 1 – 5 years of experience, and 60.7% received an ECG-related training, with 33.2% of them exposed to 5 – 10 ECG interpretations per day. Also, the mean competency score was 60.714%, with 29.6% having good level and 31.6% having excellent level of competency in ECG interpretation. Significantly higher level of competency was found in nurses with higher level of education, who took previous ECG courses and life support, and who are exposed to more ECG interpretations per day.

5.4 Limitations

1- Scarcity of ECG interpretation-related literature in the Arabic and Palestinian literature, especially for a critical part of the nurses (ER nurses).

2- Insufficient official data and statistics about ER nurses in terms of their receiving of ECG educational programs.

3- Lack of fund that is spent in the current research, which would have increased the sample size, increased the ability of covering more hospitals, especially non-governmental, and given the ability to conduct a pretest-posttest study.

4- The used tool in the current study is a self-administered questionnaire, which is more vulnerable to data collection bias, and can be replaced by one-to-one interviewing.

5- Academic and professional pressure, which made the transportation between cities in West Bank difficult.

5.5 Recommendations

1- Focus on the practice level of the nurses, increasing their level of awareness about the importance of continuous education in the area of ECG interpretation in specific, as it improves both pre-hospital care and emergency triaging system. This can be established by initiating targeted continuous nursing education (CNE) programs inside the Palestinian hospitals, as well as including the educational programs in their annual evaluation process.

2- On the policymakers' level, hospitals and stakeholders should be encouraged to assess the educational needs among nurses in regard to ECG interpretation, and build the appropriate educational plan to fill the competency-practice gap. This also includes the recommendation of assigning mandatory accredited BLS and ACLS courses for the ER nurses, which will unify the protocols and guidelines that they apply when dealing with ECG interpretation.

3- In the area of academia, it is recommended to increase the proportion of ECG Interpretation that is covered in the nursing curriculum, because it is of the most important and exposed by nurses during their duty. This recommendation is more important for diploma nurses' curriculum, which are found to have the least satisfying level of ECG interpretation.

4- Conduct further studies to assess ER nurses' educational needs and other factors that may affect their level of competency regarding ECG interpretation, as well as including more departments to compare between them. This can be applied by conducting studies with different methodological approaches, such as pre-post design, which will help in assessing the importance of educational session on the ECG interpretation level.

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Appendixes

Appendix One: Ministry of Health facilitation letter

State of Palestine Ministry of Health General Directorate of Education in Health and Scientific Research		دولة فلسطين وزارة الصحة الإدارة العامة للتعليم الصحي والبحث العلمي

Ref.: ....
Date:..................

الرقـــم: ٢٠٢٢/٤٦٠/١٣٢
التـــاريخ: ٢٠٢٢/٣/١٤

عطوفة الوكيل المساعد لمجمع فلسطين الطبي المحترم،،،

الأخ مدير عام الادارة العامة للمستشفيات المحترم،،،

تحية واحترام...

الموضـــوع: تسهيل مهمة بحث

يرجى التكرم بتسهيل مهمة الطالبة: **روان نضـال صـالح ابـو عبيـد، ماجسـتير تمـريض طوارئ– الجامعة العربية الامريكية**، لعمل بحث بعنوان:

" تقييم مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب"

حيث ستقوم الطالبة بجمع معلومات من خلال تعبئة استبانة الدراسة من ممرضي الطوارئ، ذلك في:

- **جميع المستشفيات الحكومية ومجمع فلسطين الطبي**

وذلك تحت اشراف د. بسمة سلامة، في الفترة ما بين 2022/3/15 –2022/6/1.

على ان يتم الالتزام بالمحافظة على اخلاقيات البحث العلمي وسرية المعلومات.

على ان يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية. وابراز شهادة التطعيم قبل دخول مرافق وزارة الصحة.

على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر لحين الحصول على موافقة وزارة الصحة.

مع الاحترام...

د. عبد الله القواسمي
مدير التعليم الصحي والبحث العلمي

نسخة: عميد كلية الدراسات العليا المحترم/ الجامعة العربية الامريكية

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التاريخ: 2022/02/18

حضرة د. عبدالله القواسمي مدير عام التعليم الصحي في وزارة الصحة الفلسطينية

تحية طيبة وبعد,

الموضوع: "تسهيل مهمة بحث لطلاب الدراسات العليا – تخصص ماجستير تمريض الطوارئ"

تهديكم الجامعة العربية الأمريكية أطيب تحياتها ,,,,,

إشارة إلى الموضوع أعلاه, وتماشيا مع سياسة **كلية التمريض /الجامعة العربية الأمريكية** المتعلقة بتعزيز التعاون بين المؤسسات ووزارة الصحة الفلسطينية الموقرة بإتاحة فرص الإثراء العلمي للطلبة والخريجين في المؤسسات الوطنية وإسهامها في تنمية قدراتهم وخبراتهم ونرجو من حضرتكم التكرم بالإيعاز للجهات المعنية لتسهيل مهمة الطالبة روان نضال أبو عبيد في الدراسات العليا حسب المجموعة المبينة أدناه لاستكمال بحثه العلمي بعنوان:" **مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب** " في مستشفيات وزارة الصحة وذلك لأغراض البحث العلمي حيث سيكون الهدف من الدراسة : تقييم مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب و تحديد العلاقة بين كفاءة تفسير تخطيط القلب والبيانات الاجتماعية والديموغرافية بين ممرضات الطوارئ في فلسطين و بالإضافة إلى تحديد عوامل التنبؤ بكفاءة تفسير تخطيط القلب بين ممرضات الطوارئ عن طريق استمارة يتم تعبئتها من قبل الممرضين في مستشفيات وزارة الصحة على أن تبدأ مهمتهم البحثية يوم الثلاثاء بتاريخ 2022/03/01وتنتهي يوم الأربعاء 2022/06/01 تحت إشراف (د. بسمة سلامة) .

كما أود التنويه بأن الطالبة روان نضال أبو عبيد سوف تقوم بجمع الاستمارات من تمريض الطوارئ وتعبئتها ورقيا وذلك بعد الحصول على موافقة رسمية من حضرتكم وأيضا **نتعهد بعدم ذكر أسماء المستشفيات في حال تم نشر البحث.**

مع فائق الشكر والتقدير ,,,,,,

عميدة كلية الدراسات العليا

د. شهيناز النجار

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نموذج طلب موافقة على المشاركة في بحث علمي

عنوان البحث: مستوى كفاءة ممرضي الطوارئ فيما يتعلق بتفسير تخطيط القلب في فلسطين.
مكان اجراء البحث: مستشفيات وزارة الصحة و القدس

ملخص البحث:
نقوم بهذه الدراسة جزءا لمتطلبات التخرج من برنامج ماجستير الطوارئ في الجامعة العربية الأمريكية وهي دراسة علمية تهدف لتقييم مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب و تحديد العلاقة بين كفاءة تفسير تخطيط القلب والبيانات الاجتماعية والديموغرافية بين ممرضات الطوارئ في فلسطين و بالاضافة إلى تحديد عوامل التنبؤ بكفاءة تفسير تخطيط القلب بين ممرضات الطوارئ.

معلومات عن العينة المنتقاة و الفترة الزمنية المقدرة لاستكمال الاستبيان:
تم اختيار فئة ممرضي الطوارئ لاجراء هذا البحث العلمي و ستبدأ الدراسة من لحظة استلام المشارك/ة الاستبيان المخصص لذلك لحين الانتهاء من تعبئته لفترة يستغرق من 10 الى 15 دقيقة.

المخاطر المتوقعة و الخصوصة:
ليست هناك أي مخاطر للدراسة سواء جسدية أم نفسية. سيتم حفظ خصوصية المشارك بالدراسة و التكتم على هوية المشارك و لن يتم طلب اسم المشارك ضمن هذا الاستبيان. سيتم التعامل مع العينة و المعلومات الخاصة بك بطريقة سرية ويحق للمشارك الانسحاب من البحث متى شاء دون التأثير عليه.

المنافع المتوقعة:
تتطلع هذه الدراسة للوصول الى دراسة مستوى مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب و تحديد العلاقة بين كفاءة تفسير تخطيط القلب والبيانات الاجتماعية والديموغرافية بين ممرضات الطوارئ في فلسطين.
بالاضافة الى تقديم توصيات إلى وزارة الصحة والجهات المعنية بالمستشفى وفقًا لنتائج الدراسة لتعزيز مستوى كفاءة الممرضات من خلال الدورات التدريبية في الحصول على مخطط كهربية القلب وتفسيره بهدف تعزيز جودة رعاية المرضى الذين يدخلون أقسام الطوارئ الذين يعانون من تشوهات في مخطط كهربية القلب، مما سيؤدي إلى تساعد في تعزيز رضا المريض، وتقليل معدلات الإصابة بالأمراض والوفيات.

طريقة التواصل مع الباحث:
اذا كان لدى المشارك أي استفسار أو سؤال عن الدراسة يمكنك التواصل مع الباحثة (روان أبو عبيد) بكل رحابة و في أي وقت عن طريق الايميل rawan.obaid96@gmail.com

توقيع المشارك/ة في البحث:
لقد حصلت على شرح مفصل عن الدراسة وأهدافها و المنافع المحتملة. ولقد فهمت كافة المعلومات التي قدمت لي و تمت الاجابة على أسئلتي. لذا فأنني أوافق و بكامل ارادتي على المشاركة في الدراسة.
التوقيع:
التاريخ:

State of Palestine
Ministry of Health
General Directorate of Education in
Health and Scientific Research

دولة فلسطين
وزارة الصحة
الإدارة العامة للتعليم الصحي
والبحث العلمي

Ref.: ………………
Date:………………

الرقم: ٢٠٢٢/٤٦٠/١٦٢
التاريخ: ٢٠٢٢/٣/١٩

عطوفة الوكيل المساعد لمجمع فلسطين الطبي المحترم،،،

الأخ مدير عام الادارة العامة للمستشفيات المحترم،،،

تحية واحترام،،،

الموضـــوع: تسهيل مهمة بحث

يرجى التكرم بتسهيل مهمة الطالبة: **روان نضال صالح ابو عبيد، ماجستير تمريض طوارئ- الجامعة العربية الامريكية**، لعمل بحث بعنوان:

" تقييم مستوى كفاءة ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب"

حيث ستقوم الطالبة بجمع معلومات من خلال تعبئة استبانة الدراسة من ممرضي الطوارئ، ذلك في:

- **جميع المستشفيات الحكومية ومجمع فلسطين الطبي**

وذلك تحت اشراف د. بسمة سلامة، في الفترة ما بين 2022/3/15 -2022/6/1.
على ان يتم الالتزام بالمحافظة على اخلاقيات البحث العلمي وسرية المعلومات.
على ان يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية. وابراز شهادة التطعيم قبل دخول مرافق وزارة الصحة.
على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر لحين الحصول على موافقة وزارة الصحة.

مع الاحترام،،،

د. عبد الله القواسمي
مدير التعليم الصحي والبحث العلمي

نسخة: عميد كلية الدراسات العليا المحترم/ الجامعة العربية الامريكية

Telfax.:09-2333901 scientificresearch.dep@gmail.com تلفاكس: 09-2333901

Arab American University | الجامعـــة العربيـــة الأمريكيـــة

Faculty of Graduate Studies | كلية الدراسات العليا

2022/9/5

السّادة جمعية المقاصد الخيرية المحترمين

قسم التمريض

تسهيل مهمة بحثية

تحية طيبة وبعد،

تهديكم كلية الدراسات العليا في الجامعة العربية الأمريكية أطيب التحيات، وبالإشارة الى الموضوع أعلاه، تشهد كلية الدراسات العليا في الجامعة أن الطالبة **روان نضال صالح أبو عبيد** والتي تحمل الرقم الجامعي202012812هي طالبة ماجستير في برنامج الإدارة الصحية " تمريض الطوارئ" وتعمل على رسالة الماجستير الخاصة بها بعنوان:

"تقييم مستوى ممرضي الطوارئ في فلسطين فيما يتعلق بتفسير تخطيط القلب تحت اشراف الدكتورة بسمة سلامة " نأمل من حضرتكم الإيعاز لمن يلزم لمساعدتها للحصول على المعلومات اللازمة للدراسة، علماً أن المعلومات ستستخدم لغاية البحث فقط وسيتم التعامل معها بغاية السرية، وقد أعطيت هذه الرسالة بناءً على طلبها.

وتفضلوا بقبول فائق الاحترام

عميد كلية الدراسات العليا

د. نوار قطب

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Ramallah Tel: +970-2-2941999 Fax: +970-2-2941979 Abu Qash - Near Alrehan
E-mail: FGS@aaup.edu ; PGS@aaup.edu Website: www.aaup.edu

Appendix: Questionnaire

QUESTIONNAIRE ABOUT THE COMPETENCY LEVEL OF EMERGENCY NURSES REGARDING ELECTROCARDIOGRAPHIC INTERPRETATION IN PALESTINE.

Student name: Rawan Nedal Abu Obied

Supervisor: Dr. Basma Salameh

Age:

Gender:

- Male
- Female

Level of education:

- Diploma
- Bachelor
- Master

Type of hospital:

- Governmental
- Private

District:

- North
- Middle
- South

Working experience in emergency department:

- < 1 year
- 1-5 years
- 6-10 years
- 11-20 years
- >20 years

Did you do any training course about electrocardiography?

A. No
B. Yes (if affirmative, answer the following questions)

    a. When was the last course?
        i. < 1 year or 1 year
        ii. Between 2-5 years
        iii. More than 5 years

    b. How was the course taken?
        i. Online
        ii. Face-to-face
        iii. Partial face-to-face

c. How many hours was the course?
   i. < 10 hours
   ii. 10-20 hours
   iii. >20 hours

Do you have a BLS course accredited from AHA? Yes / no

Do you have an ACLS course accredited from AHA? Yes / no

Number of ECG interpretation exposure daily:

- 0-5
- 5-10
- 10-20
- More than 20

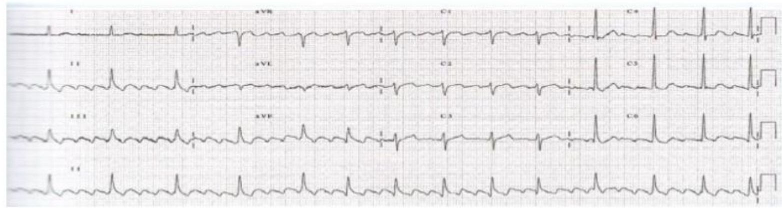
1. What is the correct order of EKG waves and intervals?

A. P wave, PR interval, QRS complex, ST interval, T wave, U wave
B. T wave, P wave, QRS complex, PR interval, ST interval, U wave
C. QRS complex, P wave, PR interval, T wave, ST interval, U wave
D. I do not know

2. If in an EKG the p wave does not appear, what is your first thought?

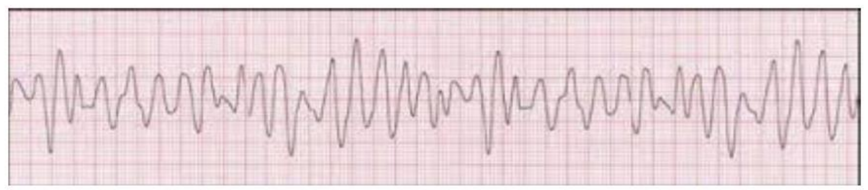
A. There is a conduction problem between the ventricles
B. There is a conduction problem between the atriums
C. It is normal, it does not have to appear in an EKG
D. I do not know

3. You perform an EKG and observe this register. What do you think it might be?



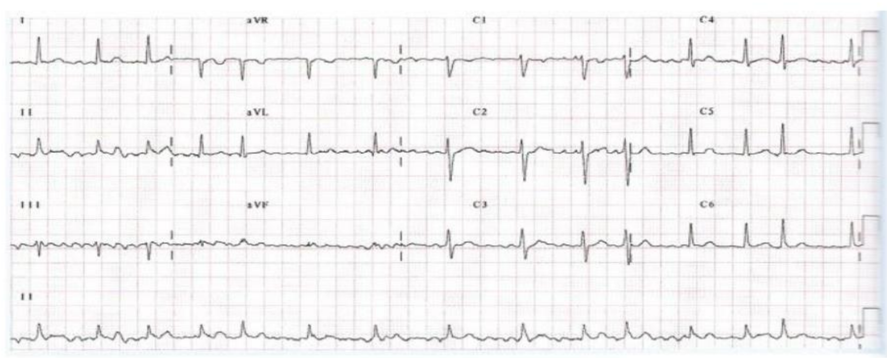
A. A third degree heart block
B. An atrial flutter
C. A supra-ventricular tachycardia
D. I do not know

4. You perform an EKG and observe this register. How would you act?



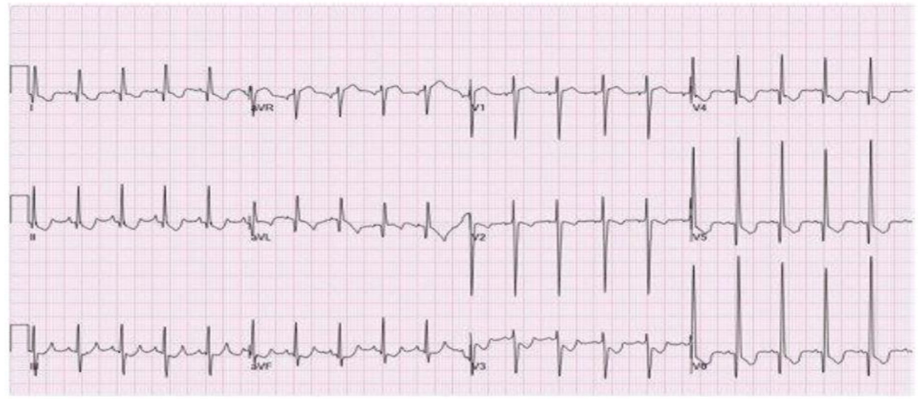
A. Ask for help without leaving the patient alone because it is a ventricular fibrillation
B. Ask for help without leaving the patient alone because it is an atrial fibrillation
C. Perform another EKG because it looks like there may be interference
D. You do not know how to act but you know it must be a serious problem

5. A patient comes to the Emergency Department due to a respiratory distress. He has 140 beats per minute. You perform an EKG and observe the following:



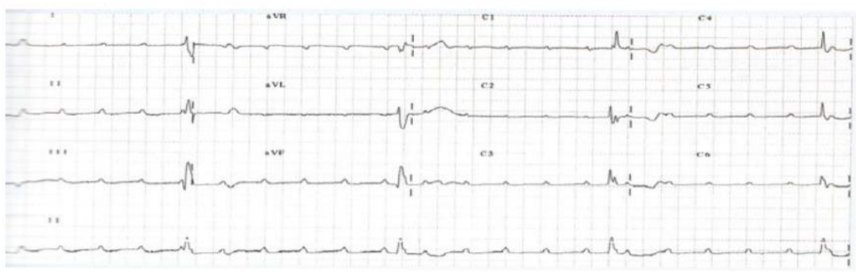
A. It is an atrial tachycardia
B. It is an atrial fibrillation
C. It is an atrial extra-systole
D. I do not know

6. A patient comes to the Emergency Department with precordial pain for more than 8 hours. You perform a 12-branch EKG. After observing the EKG, what catches your attention?



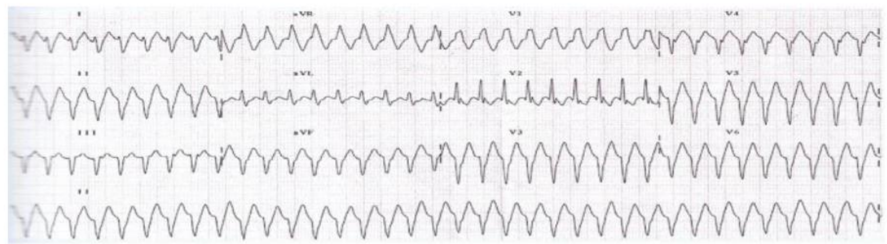
A. You can see pathological pauses
B. You can see pathological Q waves
C. The patient has a low cardiac rhythm
D. I do not know

7. What pathology you think the patient with this EKG has?



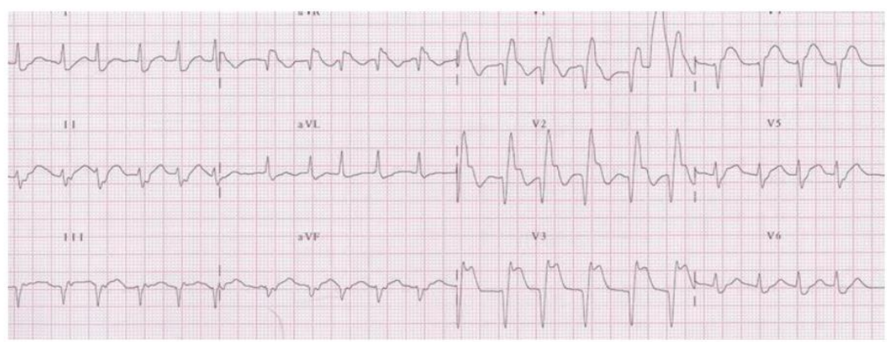
A. A first-degree heart block
B. He does not have any pathology
C. A third-degree heart block
D. I do not know.

8. A hospitalized patient who had had surgery due to an acute MI is transferred to the Emergency Department to be monitored because his vital signs are unstable. You perform an EKG and observe the following:



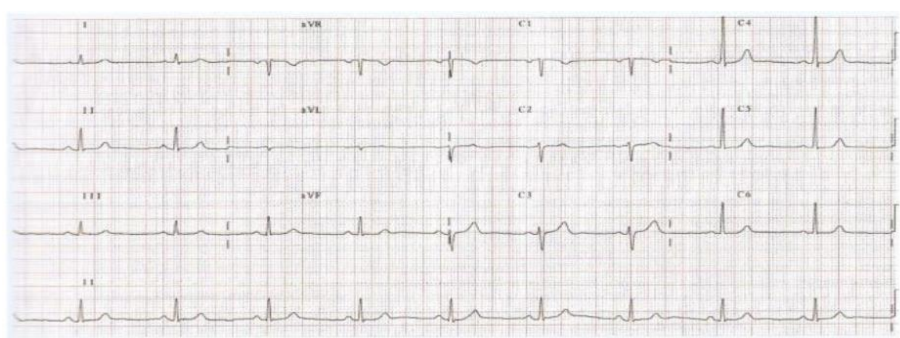
A. The patient presents a ventricular tachycardia
B. The patient presents a supra-ventricular tachycardia
C. The patient presents an atrial tachycardia
D. I do not know

9. You are in triage and call a patient who reports medium-intensity precordial pain. He tells you that the pain appeared after leaving an important meeting two hours ago. He is 52 years of age and hypertensive and a few months ago he was diagnosed with Diabetes Mellitus II. You perform a 12-branch EKG and observe the following:



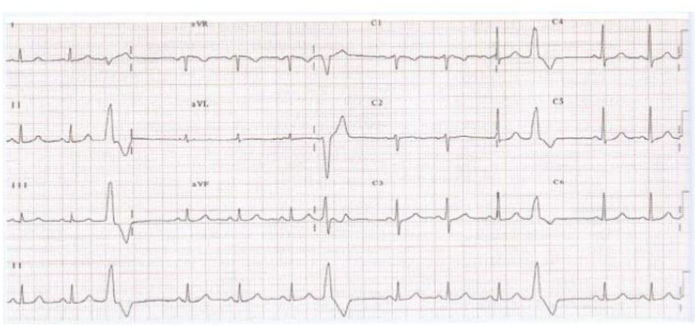
A. It is a supra-ventricular tachycardia
B. It is an acute myocardial infarction
C. It is an acute myocardial infarction with a pathological Q wave
D. I do not know.

10. A 24-year-old male comes to the Emergency Department He is athletic and slim. He reports feeling a pricking sensation in the left area of his chest since he finished doing exercise (3 hours earlier). You perform an EKG and observe the following:



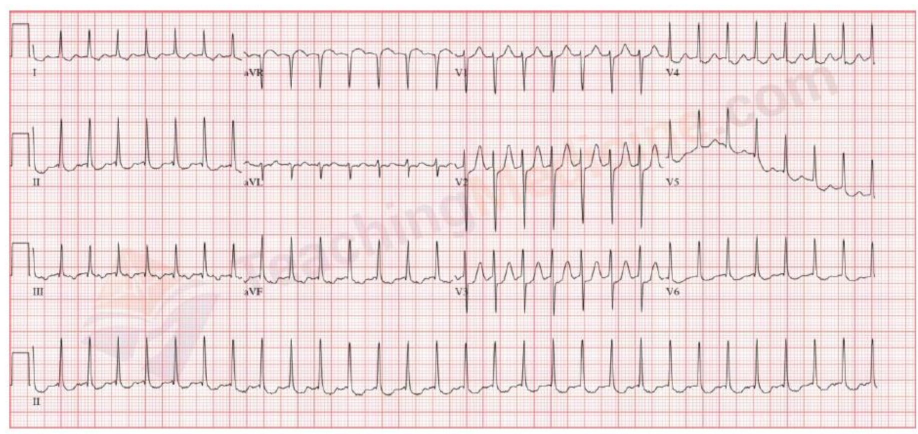
A. It is an atrial bradycardia
B. He has conduction problems
C. It is a normal EKG
D. I do not know

11. A patient with digitalis intoxication comes from a hospitalization ward. Before monitoring him you perform an EKG and obtain the following:



A. You observe an atrial extra-systole
B. You observe a ventricular extra-systole
C. You observe that he is carrying a pacemaker
D. I do not know

12. A 30-year-old woman comes to the Emergency Department reporting palpitations, chest tightness and dyspnea. You perform an EKG and observe the following:

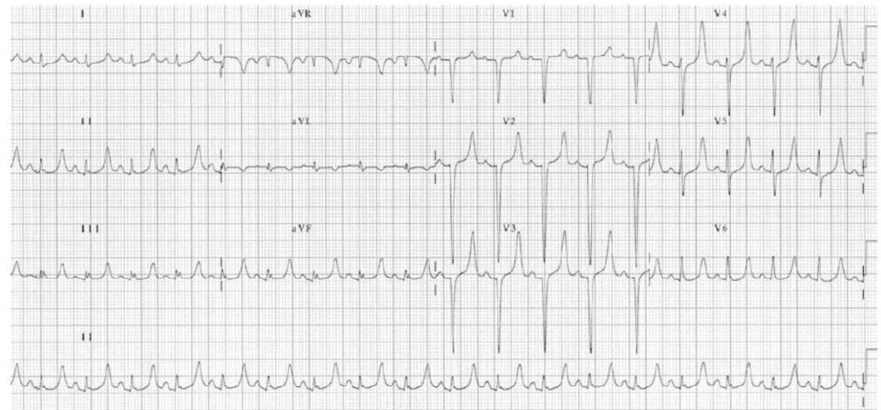


A. It is a ventricular tachycardia
B. It is an atrial extra-systole
C. It is a supra-ventricular tachycardia (SVT)
D. I do not know

13. As an emergency nurse, what is the first step you do with person have confirmed asystole:

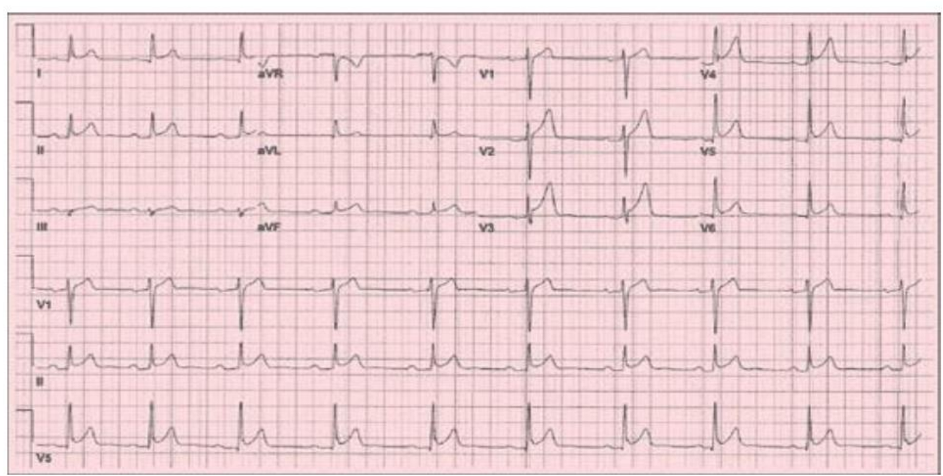
A. Activate emergency response team and start high quality CPR
B. Apply IV/ IO access then activate emergency response team
C. Inform Dr and apply IV access
D. Inform emergency response team then give DC shock

14. A male patient comes to emergency department complaining of general weakness and decreased urinary output. You perform an EKG and observe the following



A. It is a pathological Q wave and inform Dr
B. It is a hyperkalemia and start management immediately
C. It is a normal EKG
D. I don't know

15. Young patient comes to emergency department complaining of chest pain. You perform an EKG and observe this:



A. It is an acute ST elevation MI
B. It is a pericarditis
C. It is ventricular tachycardia
D. I don't know

Thank you.

ملخص الدراسة

مقدمة يعد مخطط كهربية القلب (ECG) من أكثر الأدوات استخدامًا داخل غرف الطوارئ من قبل الممرضين في عملية التشخيص والفرز، وبالتالي من المهم أن يكتسبوا مستوى الكفاءة المناسب في تفسير تخطيط القلب، مما سيعزز الرعاية الصحية وتحسين النتائج لدى المرضى.

الهدف من الدراسة الحالية هو تحقيق مستوى الكفاءة بين ممرضي غرفة الطوارئ في الضفة الغربية - فلسطين فيما يتعلق بتفسير تخطيط كهربية القلب، والعوامل الاجتماعية والديموغرافية والمهنية المقابلة.

طريقة البحث: تم اختيار دراسة وصفية مقطعية، وتم تعيين عينة من 196 ممرض من قسم الطوارئ بشكل ملائم وطُلب منهم ملء استبيان ذاتي التعبئة يستند إلى الأدبيات السابقة. تم تحليل البيانات باستخدام برنامج SPSS مع الالتزام الكامل بالاعتبارات الأخلاقية.

النتائج: بلغ معدل الاستجابة 86.7٪، 70.9٪ من الممرضين ذكور، 65.3٪ حاصلون على درجة البكالوريوس في التمريض، 89.3٪ يعملون في المستشفيات الحكومية، 46.9٪ بخبرة تتراوح بين 1-5 سنوات ، 60.7٪ تلقوا دورات سابقة متعلقة بتفسير تخطيط القلب. كان متوسط مستوى الكفاءة لممرضي الطوارئ مرضيًا (60.714٪) و38.8٪ لديهم مستوى ضعيف من الكفاءة، ومستوى كفاءة أعلى بكثير بين الممرضين الحاصلات على مستوى تعليمي أعلى (القيمة الاحتمالية <0.001)، الذين تلقوا دورات سابقة في تخطيط القلب (القيمة الاحتمالية = 0.045) ودورات دعم الحياة (القيمة الاحتمالية <0.05) والذين يتعرضون لعدد أكبر من تفسيرات تخطيط القلب يوميًا (القيمة الاحتمالية = 0.001).

الملخص: يوصى بالتركيز أكثر على مستويات كفاءة تفسير تخطيط القلب في الأبحاث الفلسطينية، والمقارنة بين الأقسام المختلفة، مع الحاجة إلى تقييم احتياجات الممرضين من حيث التعليم المستمر.

الكلمات المفتاحية: عدم انتظام ضربات القلب، مخطط كهربية القلب، تخطيط القلب، تفسير، كفاءة، ممرضات، غرفة طوارئ