Global Academic Nursing Journal

REVIEW ARTICLE

Knowledge and practices of nurses in performing and interpreting the electrocardiogram

Conocimientos y prácticas de los enfermeros en la realización e interpretación del electrocardiograma

Saberes e práticas de enfermeiros na realização e interpretação do eletrocardiograma

Wallace Henrique Pinho Paixão[1]
ORCID: 0000-0002-2533-4707
Kessya Cristine Valentim Barbosa[2]
ORCID: 0000-0002-8490-2575
Kelly Cristina Freitas da Silva Santos[1]
ORCID: 0000-0002-0882-8537
Ana Claudia Lopes Almeida[3]
ORCID: 0000-0002-8123-8402
Akyl da Silva Pereira[4]
ORCID: 0000-0002-2357-7924
Cinthia Cristina Costa Bezerra[5]
ORCID: 0000-0002-2665-4278
Bruno dos Santos Offredi[6]
ORCID: 0000-0001-8951-7003

[1]Instituto Nacional do Câncer. Rio de Janeiro, Brazil.
[2]Hospital Federal do Andaraí. Rio de Janeiro, Brazil.
[3]Instituto Nacional de Cardiologia. Rio de Janeiro, Brazil.
[4]Secretaria Municipal de Saúde do Rio de Janeiro. Rio de Janeiro, Brazil.
[5]Ministério da Defesa. Rio de Janeiro, Brazil.
[6]Universidade Castelo Branco. Rio de Janeiro, Brazil.

How to cite this article:
Paixão WHP, Barbosa KCV, Santos KCFS, Almeida ACL, Pereira AS, Bezerra CCC, Offredi BS. Knowledge and practices of nurses in performing and interpreting the electrocardiogram. Glob Acad Nurs. 2021;2(3):e165. https://dx.doi.org/10.5935/2675-5602.20200165

Corresponding author:
Wallace Henrique Pinho Paixão
E-mail: whpp2601@hotmail.com

Submission: 04-23-2021
Approval: 05-17-2021

Abstract

The aim of the present study was to analyze the knowledge of nurses in aspects related to the electrocardiogram exam. This is an integrative review using the BVS, PubMed and Academic Google databases. Used in conjunction with the Boolean AND operator. Twelve articles were found, 8 in Portuguese and 4 internationals. More than half of the articles indicate that nurses have a deficit in knowledge about the placement of the electrodes and the interpretation of the electrocardiographic tracing. In addition to demonstrating the relationship between time since graduation and professional experience, and improvement courses, where professionals who had undergone previous training, showed better performance. We conclude that it is essential that nurses have sufficient scientific knowledge to interpret electrocardiographic tracings. Furthermore, continuing education proved to be of fundamental importance in training and updating knowledge.

Descriptors: Electrocardiography; Surge Capacity; Knowledge Bases; Cardiovascular Nursing.

Resumén

El objetivo del presente estudio fue analizar el conocimiento de enfermeros en aspectos relacionados con el examen de electrocardiograma. Esta es una revisión integradora que utiliza las bases de datos de BVS, PubMed y Academic Google. Se utiliza junto con el operador booleano AND. Se encontraron 12 artículos, 8 en portugués y 4 internacionales. Más de la mitad de los artículos indican que los enfermeros tienen un conocimiento deficiente sobre la colocación de los electrodos y la interpretación del trazado electrocardiográfico. Además de demostrar la relación entre el tiempo desde la graduación y la experiencia profesional, y los cursos de perfeccionamiento, donde los profesionales que habían tenido una formación previa, mostraron un mejor desempeño. Concluimos que es fundamental que el enfermero tenga los conocimientos científicos suficientes para interpretar los trazados electrocardiográficos. Además, la educación continua demostró ser de fundamental importancia para la formación y actualización de conocimientos.

Descriptores: Electrocardiografía; Capacidad de Reacción; Descubrimiento del Conocimiento; Enfermería Cardiovascular.

Resumo

O objetivo do presente estudo foi analisar o conhecimento de enfermeiros nos aspectos relacionados ao exame de eletrocardiograma. Trata-se de uma revisão integrativa através das bases BVS, PubMed e Google Acadêmico. Utilizados em conjunto com o operador booleano *AND*. Foram encontrados 12 artigos, sendo 8 em português e 4 internacionais. Mais da metade dos artigos apontam que os enfermeiros possuem déficit no conhecimento sobre o posicionamento dos eletrodos e a interpretação do traçado eletrocardiográfico. Além de demonstrar a relação entre o tempo de formação e experiência profissional e cursos de aperfeiçoamento, onde profissionais que haviam realizado treinamentos prévios, demonstraram melhor desempenho. Concluímos que é imprescindível que enfermeiros tenham conhecimento científico suficiente para interpretar os traçados eletrocardiográficos. Ademais, a educação continuada se mostrou de fundamental a importância na capacitação e atualização dos conhecimentos.

Descritores: Eletrocardiografia; Capacidade de Resposta ante Emergências; Bases de Conhecimento; Enfermagem Cardiovascular.

Introduction

Cardiovascular Diseases (CVDs) are considered the diseases that kill the most annually in the world population. According to global data released in 2016, it is estimated that 17 million people died from CVD. In Brazil alone, between the beginning of this year and the end of November, there were more than 836,000 deaths from diseases that damage the cardiovascular system[1,2].

Changes of cardiac origin are commonly found in emergency rooms and intensive care units (ICU), and can appear at any age, sex, race, and changes can occur for various reasons and manifest in different ways[3].

O indivíduo apresentando essas alterações pode manifest or not symptoms. When symptomatic, clinical manifestations can be palpitations, chest pain, tiredness, shortness of breath, dizziness, indisposition, and more vigorous heart rate at rest[4].

The most used tool to contribute to the diagnosis of CVD is the electrocardiogram, which shows the electrical activity of the heart in a non-invasive, pain-free, easy to perform, low-cost way, free of direct risks to the individual, used in outpatient clinics and emergency units and emergency[5].

The ECG has 12 leads, differing in peripheral and precordial. There are situations in which it is necessary to use specific leads, distinct from standard leads, depending on the suspicion that the cardiac muscle wall may be compromised, as in the cases of leads that will record the right ventricular wall and the posterior wall of the heart, understanding that on the standard ECG, these walls are not recorded[6].

Although the ECG exam is simple to handle, its interpretation requires a study in rigorous detail. For this, the professional will need to know the normal pattern and the basics for its interpretation, namely: calculate the heart rate, analyze the heart rate, know the intervals and segments between waves, among others. So that you can recognize pathological changes. The ECG, in addition to capturing cardiac alterations of cardiocirculatory origin, also captures alterations of extra-cardiac origin, such as metabolic alterations[7].

Performing the technique and interpreting the electrocardiographic waves have the same level of relevance. Correct placement of the electrodes requires a brief anatomical knowledge from the professional. It should also be noted that there are factors that interfere with the electrocardiographic recording. These interferences must be detected and removed so as not to compromise the quality and accuracy of the electrocardiographic recording[8].

Knowing that failure to correct these factors can lead to a false diagnosis and consequently to inadequate professional conduct in the treatment of the patient, there are specific procedures that must be carefully investigated before and during the procedure, such as guiding the patient to remove all adornments that contain metal before settling in, the stretcher away from the wall or any object around it, supine and static, the skin region where the electrode will be placed must be previously clean and dry, avoid excess gel or paste to facilitate conduction , if electrode in the shape of a pear, avoiding to reduce the adhesion of the electrode to the skin[8,9].

Monitoring the patient through the electrocardiograph is common in hospitals and health centers, as the exam can detect changes in the electrical conduction of the heart, foreshadowing risks to the individual's life. In addition, in hospital units, the electrocardiographic tracing can be presented through multiparametric monitors, which are medical devices used to monitor various physiological parameters[8,10].

Nurses, in their practice, have comprehensive care as their responsibility, as part of a care team, which is continuously beside the patient. Therefore, knowing how to recognize and interpret normal and pathological electrocardiographic tracings is of fundamental importance, in addition to providing guided training to understand the clinical signs and diagnostic methods in the context of cardiovascular disease[7].

Studies show that nurses have difficulty in identifying cardiac alterations, regardless of the length of work, including the identification of analysis of electrocardiographic tracings with ST-segment elevation. Corroborating with studies that concluded the need to carry out more studies on electrocardiogram in various areas of activity by non-medical professionals, through the analysis and conduct according to the investigated results[8,11,12].

Given the above, the fundamental importance of nurses having the aptitude and training to identify possible abnormalities in electrocardiogram exams is understood. What guided the purpose of this work: what is the knowledge of nurses about the technique for performing and interpreting the electrocardiogram?

The present study aims to identify the scientific productions regarding the role of nurses in the practice of performing the electrocardiogram exam and in the recognition of the main cardiovascular alterations presented, in addition to identifying correlations between the training profile and the unit of activity.

Methodology

This study is a descriptive study with a qualitative approach, through an integrative literature review. The integrative review is more comprehensive in terms of the methodological approach, which allows a wide use of studies, whether experimental or non-experimental, aiming to clearly understand the investigation. It also allows for review research in many areas of knowledge, combining data from empirical and theoretical literature, leading to the definition of concepts, determination of spaces in the study areas, review of theories and analysis of research methodology on a specific topic[13,14]. Searches for the selection of studies were carried out between the months of June and August 2020. Data collection was carried out after defining the guiding question, what is the knowledge of nurses about the technique for performing and interpreting the electrocardiogram? Once defined, searches for publications in indexed journals were started, and later, there was a critical reading of titles, abstracts, and full texts.

The chosen databases and the Virtual Health Library (BVS) and Nursing Database (BDENF) data platform, Latin American and Caribbean Health Sciences Literature (LILACS), PubMed, Academic Google. The following descriptors were determined: Electrocardiography, Emergencies, Nursing, Knowledge. Used in conjunction with boolean AND. It is noteworthy that the determination of descriptors was performed after consulting the Health Science Descriptors.

After determining the inclusion criteria, a literature search was carried out for bibliographical references, and the articles were published in Portuguese, English and Spanish. A time frame between the years 2015 and 2020 was used, with abstracts available in computerized databases, with full text available on the internet, institutional computers or provided by the original source.

Once the inclusion and exclusion criteria were determined, the search for articles was started using the descriptors already determined, resulting in 12 articles, 06 found in the VHL, 04 found in PubMed and 02 found in Academic Google, the process from the initial search even the selection of articles selected for discussion were described in the PRISMA recommendation (Figure 1). A synoptic table was created (Chart 1) detailing the information regarding the articles, such as: Author and year, publication journal, title, objective, study characteristics and journal Qualis.

Figure 1. Flowchart of the initial quantity of articles found in the databases until their final selection according to Prisma recommendation according to PRISMA recommendation. Rio de Janeiro, RJ, Brazil, 2020

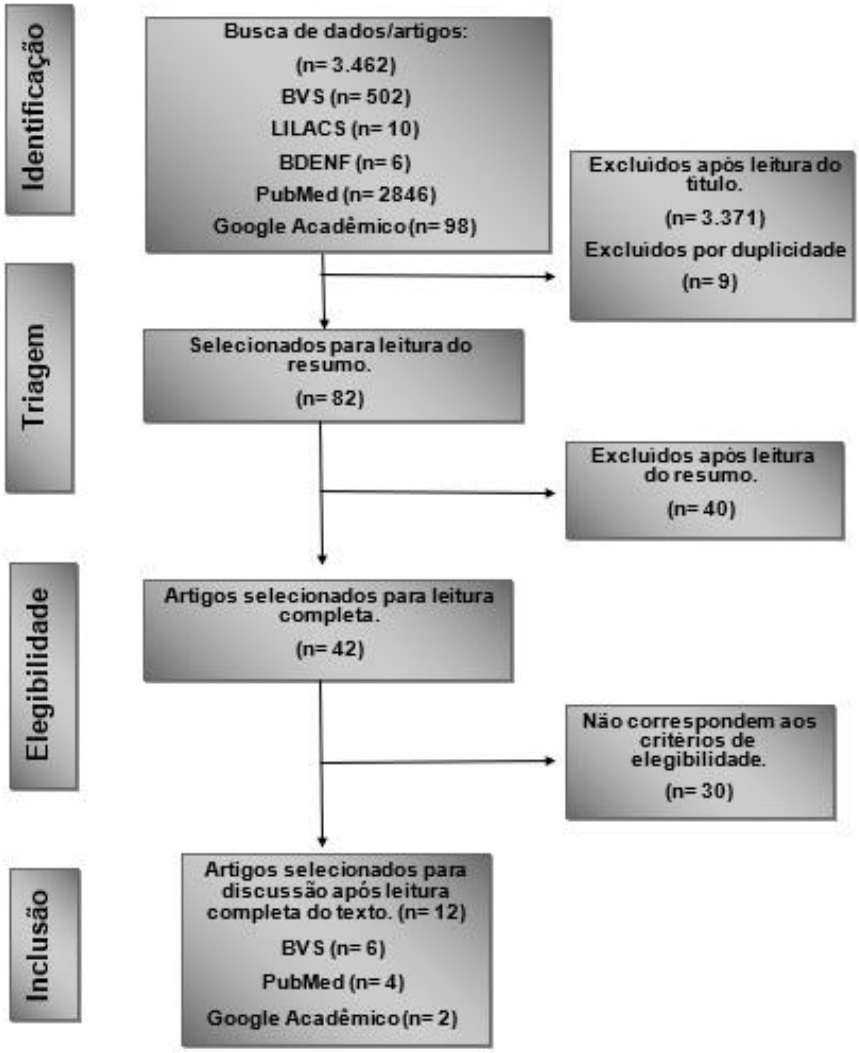


Chart 1. Classification of selected articles according to author and year, journal of publication, title, objective, study characteristics and journal qualis. Rio de Janeiro, RJ, Brazil, 2013-2016

Author and year	Journal	Title	Objective	Study characteristics	Qualis
Fernandes LS, Lira MCDLS, França VV, Valois AA, Valença MP.	Revista Baiana de enfermagem.	Conhecimento teórico e prático de enfermeiras sobre o eletrocardiograma	Identify nurses' knowledge of 12-lead ECG.	Location: Recife, PE Study Type: Exploratory Sample: 53 nurses from the health institution.	B2

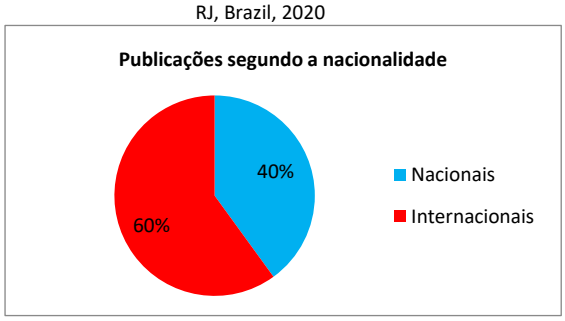
Guimarães DBO, Rodrigues TS, Oliveira SCM, Avelino FVSD.	Revista de Enfermag em UFPE online.	Tempo porta eletrocardiograma em pacientes com dor torácica na emergência	Identify the electrocardiogram door time in patients with chest pain in the emergency room.	Location: Recife, PE Type of study: Integrative review Sample: 10 articles found in the VHL, MedLine, Web of Science and Cinahl databases, between 2012 and 2017.	B2
Machado MJR, Paes MR, Ribeiro ACG, Segui MLH, Brusamarello T.	Revista de enfermag em UERJ.	Ritmos cardíacos à beira do leito: conhecimento da equipe de enfermagem de unidade cardiológica	To analyze the knowledge of the cardiology unit nursing team about cardiac rhythm alterations.	Location: Curitiba, PR Type of study: descriptive qualitative. Sample: 17 nursing professionals from a cardiology unit.	B1
Saffi MAL, Bonfada MS.	Revista Baiana de enfermag em.	Conhecimento de enfermeiros no manejo e interpretação do eletrocardiograma	Assess nurses' knowledge in the analysis and basic interpretation of the electrocardiogram.	Location: Porto Alegre, RS Type of study: Cross-sectional with a quantitative approach. Sample: 24 nurses from the medical and surgical clinic, operating room, intensive care, and emergency departments.	B2
Santos LDSFD, Costa RL, Santos PRD, Espindola SP, Bertholy CRDSS, Severiano SGDC, et al	Revista de enfermag em UERJ.	Habilidades dos enfermeiros na interpretação do eletrocardiograma de 12 derivações	Assess the ability of nurses to recognize electrocardiographic changes that require immediate intervention and compare their performance in relation to arrhythmias, according to the type of unit in which they work.	Location: São Paulo, SP. Type of study: Cross-sectional unicentric. Sample: 100 Nurses, 64 from critical areas and 36 from non-critical areas.	B1
Santos LDSFD, Costa RL, Santos PRD, Espindola SP, Bertholy CRDSS, Severiano SGDC, et al.	Revista Nursing São Paulo.	Eletrocardiograma na prática do enfermeiro em urgência e emergência	The objective was to analyze productions on the clinical practice of nurses regarding the electrocardiogram in urgent and emergency situations in Brazil.	Location: Petrópolis, RJ. Type of study: Integrative review with a qualitative approach. Sample: 7 articles found in LILACS, SciELO, MedLine and BDENF databases.	B2
Tahboub OYH, Yılmaz ÜD.	International Journal of Cardiovascular Research.	Nurses' Knowledge and Practices of Electrocardiogram Interpretation	To determine knowledge and practice of ECG among nurses in university hospitals in Northern Cyprus.	Location: Cyprus, Turkey Study Type: Exploratory Sample: 65 Registered nurses in the hospital staff.	B3
Badell MC, Herrera MFJ, Serra ML.	Journal of Emergency Nursing.	Emergency nurse competence in electrocardiographic interpretation in Spain: a cross-sectional study	Determine the current level of competence in electrocardiographic interpretation of nurses in an emergency department.	Location: Spain. Type of study: Cross-sectional multicenter. Sample: 60 nurses from emergency units at 2 hospitals in the country, working for more than one year and more than once a week.	N/A
Brooks CA. Kanyok N. O'Rourke C. Albert NM.	American Journal of Critical Care-AJCC.	Retention of Baseline electrocardiographic Knowledge after Ablended learning course	A course with nurses was held. After three weeks a test was carried out and after eight weeks another test was carried out. The objective was to compare the level of fixation and memorization between the two periods and to understand the self-assessment by the nurses themselves.	Location: Cleveland, Ohio Prospective, comparative study, using pre- and post-test. Sample: 69 Nurses.	A1
Werner K, Kander K, Axelsson C.	European Journal of Cardiovascular Nursing	Interpretação do eletrocardiograma habilidades entre enfermeiros de ambulância	Describe the practical skills of interpreting the electrocardiogram in ambulance nurses and assess the correlation between these skills and factors that can impact the level of knowledge.	Location: Sweden Type of study: Prospective quantitative research. Sample: 132 Ambulance nurses.	A1
Ribeiro DG, Príncipe FP.	Revista Espaço para a Saúde	Conhecimento da equipe de enfermagem de setores críticos na	analyze knowledge of the nursing team of critical sectors by performing and interpreting an electrocardiogram.	Location: Curitiba, PR Type of study: Exploratory descriptive, quantitative approach. Sample: 10 nurses and 25 nursing	B3

		realização e interpretação de eletrocardiograma		technicians.	
Monteiro NO, Marçal DC, Bitencourt IF, Rocha LS, Dias EC.	Revista Científica Univiçosa	Habilidades dos enfermeiros na realização e interpretação do eletrocardiograma em pronto atendimento.	Identify the nurses' knowledge about the performance and interpretation of the electrocardiogram (ECG) in urgent and emergency care.	Location: Viçosa, MG Type of study: literature review Sample: 10 articles and 1 government website.	N/A

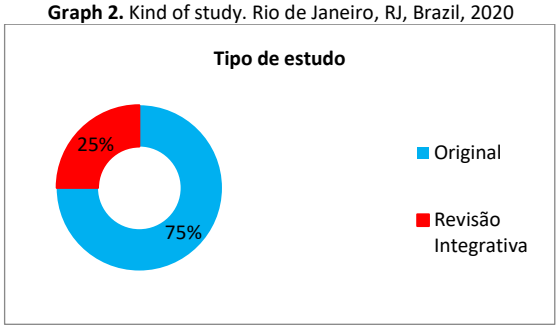
After the complete reading of the text, 12 articles were selected. Subsequently, the articles were arranged in a chart containing the following data: Author/year, journal, title, objective, results, and journal Qualis (Figure 1; Graph 2).

Once the data analysis was completed, 8 (67%) of the articles were national and the other 4 (33%) were international (North America and Europe), respecting the 5-year time frame (Graph 1).

Graph 1. Publications according to nationality. Rio de Janeiro, RJ, Brazil, 2020



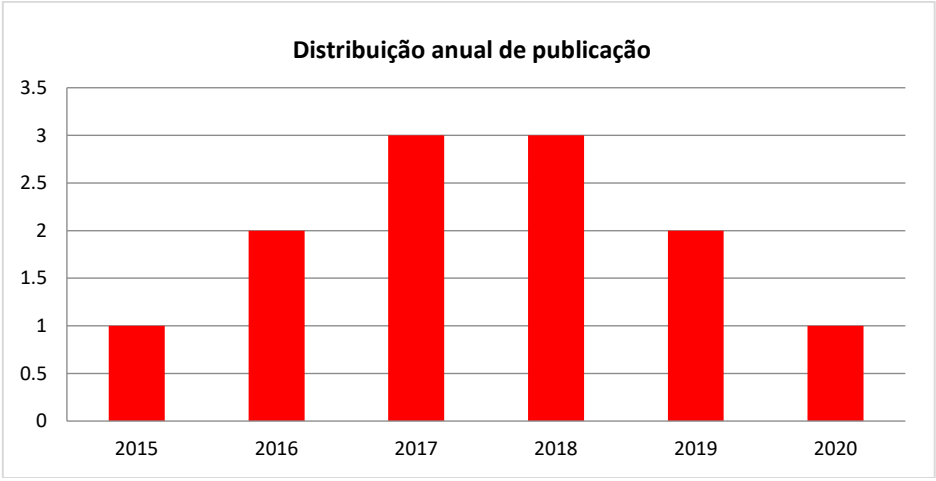
Graph 2. Kind of study. Rio de Janeiro, RJ, Brazil, 2020



As for the type of study, of the 12 selected articles, 6 are original studies, 2 integrative research studies, 2 case studies, 1 documental study and 1 bibliographic study (Graph 2).

It was identified that the largest number of publications occurred in 2017 and 2018 (25%), followed by 2016 and 2019 (17%), with 2015 and 2020 having the lowest number of publications (8%) (Chart 3).

Graph 3. Annual publication distribution. Rio de Janeiro, RJ, Brazil, 2020



Discussion

The Electrocardiogram

The electrocardiograph, through the electrodes, captures the electric field of the heart in a three-dimensional way, presenting, through tracings, the cardiac electrical impulses in a regular and rhythmic way. The standard ECG is composed of 12 leads, namely: I, II, III, aVR, aVL and AvF arranged in the limbs, classified as peripheral, and V1 to V6, arranged in the anterior aspect of the chest, classified as precordial. Where V1 – 4th intercostal space, on the right sternal line; V2 – on the same level as V1, but on the left side; V3 – between V2 and V4; V4 – 5th intercostal space, left midclavicular line; V5 – same level as V4 in the left anterior axillary line; V6 – left midaxillary line[8,18,24].

The electrocardiogram is considered a low-cost, easy-to-handle test, however the pre-exam preparation is as important as the interpretation, in addition to requiring knowledge of cardiac electrophysiology, technique, and interpretation of electrocardiographic tracings. It is a non-invasive test and does not expose the patient to risks[18-20].

In their tracings, it is possible to identify cardiac alterations such as AMI, bundle branch blocks, arrhythmias, cardiac arrests such as: pulseless ventricular tachycardia, pulseless electrical activity, ventricular fibrillation, atrial fibrillation, among others[7,16,24].

It is noteworthy that all heart diseases require specific treatment, and to achieve a good prognosis, the need for the use of electrocardiograms must first be identified. Furthermore, reliable, and careful interpretation and intervention contribute to a favorable recovery[5,8].

Nurses' skills in performing the electrocardiogram

The electrocardiogram is considered a gold standard test for diagnosing cardiac arrhythmias. It is possible to carry out cardiac follow-up of the patient. To obtain a safe and effective evolution, the nursing team must obtain theoretical and practical knowledge about the exam, as these professionals are fully with the patient at the bedside and for a longer time[18].

A study[8] evidenced low knowledge of the nurses interviewed regarding the positions of the precordial electrodes, where 63.8% answered incorrectly or did not know the purpose of the electrocardiogram. Corroborating with others who also reported deficits in performing the electrocardiogram performed by nurses. However, another study showed that most nurses knew how to describe relevant factors for the preparation of the exam. Most nurses know the pre-exam guidelines[18,23].

For the electrocardiographic tracing to be adequate, it is necessary to fulfill certain criteria, such as: guiding the patient to remove adornments that contain metal; immobility and supine position; analyze the integrity of the skin, as well as its hygiene; perform trichotomy, if necessary. Failure to correct these factors can lead to a false diagnosis and consequently to inadequate professional conduct in the treatment of the patient[8].

Thus, the nurse is the professional responsible for providing continuous care. And among many of its attributions, the performance and interpretation of the electrocardiogram is included. Therefore, the nurse must be aware of any changes that may endanger the health and life of the patient, anticipating possible episodes of arrhythmias or intervening diligently and attentively[8,20,23].

The nurse and the interpretation of the electrocardiogram

It is known that the Nurse performs the examination and analysis of the electrocardiographic tracing, however, the report and diagnosis is a medical attribution[19,24].

However, the nurse is responsible for providing more complex patient care, and requires greater scientific knowledge, being the professional who readily observes the evolution of patients, positively or negatively. Thus, the need for theoretical and practical knowledge and interpretation of the electrocardiogram[17-20].

In a study carried out in Sweden[12], which investigated the ability of ambulance nurses to identify changes in the electrocardiographic tracing, revealed that respondents failed to identify AMI and ventricular fibrillation. Disagreeing with another study[18] which showed a considerably positive result, with 100% of the theoretical questions and 94% of the practical questions answered correctly. In turn, a study carried out with nurses at a hospital in Rio Grande do Sul showed a variable result in terms of nurses' knowledge[21].

Other studies have shown that nurses have difficulty recognizing other arrhythmias, such as: ventricular tachycardia, supraventricular tachycardia and AMI[17].

Nurses working in critical sectors showed relatively greater knowledge when compared to nurses in non-critical sectors. This may be due to the constancy in which the nurse is faced with situations of changes in the ECG[7].

Furthermore, nurses with recent training had better results when compared with nurses without training or outdated. The constant training with small intervals of time between trainings was effective for the good performance of the team. The study[10] also points out that, in addition to training, nurses are responsible for supervising the technical staff and nursing assistants.[5,8].

Studies[2,5] report that most nurses with specialization obtained better results in the questionnaire. However, it confirms that continuing education must be permanent, as it contributes both to quality knowledge for nurses and to patient safety[6,8].

Conclusion

Based on the results found in the articles, it denotes the limited knowledge of nurses about the electrode placement technique and the interpretation of electrocardiographic tracings. Such conditions may promote a false diagnosis, increasing the risk of serious complications.

Nurses are professionals who are in direct and uninterrupted contact with the patient. Based on this, it is essential that they have sufficient scientific knowledge to interpret the electrocardiographic tracings and identify possible changes, so that they can intervene in a short and timely manner to prevent tissue damage and preserve life.

The importance of continuing and permanent education is highlighted, as continuous training provides the professional with theoretical and practical knowledge of the ECG, in addition to improving skills for taking the exam. Promoting security in your professional practice that simultaneously reflects in a safe and quality care. According to studies[25], "Permanent education works with the teaching-learning process, integrating technical, ethical, political and educational aspects between professionals and educators", aiming at improving the team's work and the quality of care.

It is evident that the search for qualification and updating by the professional had a significant impact on the results of the studies. Based on this information, the importance of constant training is emphasized. A deficit was identified in the studies that addressed the knowledge of nurses in aspects related to the performance and interpretation of the electrocardiogram, demonstrating the need for further studies.

References

1. Organização Pan- Americana da Saúde. Doenças cardiovasculares. [Internet]. 2019 [acesso em 23 mar 2020]; Disponível em: https://www.paho.org/pt/topicos/doencas-cardiovasculares
2. Sociedade brasileira de Cardiologia. Cardiômetro: Mortes por doenças cardiovasculares no Brasil. [Internet]. 2020 [acesso em 23 mar 2020]; Disponível em: http://www.cardiometro.com.br/
3. Ferreira PP. Urgência e Emergência cardiológica: o reconhecimento das principais arritmias cardíacas pelo enfermeiro. [Trabalho de Conclusão] Curso de enfermagem. Ed. Fundação de Ensino e Pesquisa do Sul de Minas. [Internet]. Virgínia; 2015 [acesso em 21 set 2020]. Disponível em: http://repositorio.unis.edu.br/handle/prefix/233
4. Sociedade Brasileira de Arritmias Cardíacas. Campanha coração na batida certa: Brasil em ação pela prevenção e tratamento das arritmias cardíacas e morte súbita. [Internet]. 2018 [acesso em 23 mar 2020]; Disponível em: https://sobrac.org/home/campanha-coracao-na-batida-certa-brasil-em-acao-pela-prevencao-e-tratamento-das-arritmias-cardiacas-e-morte-subia
5. Santos LDSFD, Costa RL, Santos PRD, Espindola SP, Bertholy CRDSS, Severiano SGDC, et al. Eletrocardiograma na prática do enfermeiro em urgência e emergência. 2019; 2979-2989.
6. Timerman CBS, Polastri TF, Giannetti NS, Siqueira AWS, Piscopo A, Soeiro AM, et al. Atualização da diretriz de ressuscitação cardiopulmonar de emergência da Sociedade Brasileira de Cardiologia. Arq. Bras. Cardiol. 2019;113(3): DOI:10.5935/abc.20190203
7. Santana SE, Pires EC, Silva JT, Sallai VS, Bezerra DG, Lucena FR. Habilidade dos enfermeiros na interpretação do eletrocardiograma de 12 derivações. Rev Baian Enferm. [Internet]. 2017[acesso em 23 mar 2020];(1)31. Disponível em: https://rigs.ufba.br/index.php/enfermagem/article/view/16581/14076
8. Fernandes LS, Lira MCDLS, França VV, Valois AA, Valença MP. Conhecimento teórico-prático de enfermeiras sobre eletrocardiograma. Rev Baian Enferm. [Internet]. 2017 [acesso em 23 marc 2020];29(2) Disponível em: https://periodicos.ufba.br/index.php/enfermagem/article/view/12654/pdf_119
9. Pastore CA, Pinho JA, Pinho C, Samesima N, Pereira FHG, Kruse JCL, Gomes CIG. III Diretrizes da Sociedade Brasileira de Cardiologia sobre análise e emissão de laudos eletrocardiográficos. Arq. Bras. Card, [Internet]. 2016 [acesso em 20 mar 2020];106(4):1-23 Disponível em: http://publicacoes.cardiol.br/2014/diretrizes/2016/01_III_DIRETRIZES_ELETROCARDIOGR%C3%81FICOS.pdf
10. Almeida PM. Alarmes dos monitores multiparâmetros: implicação na assistência de uma emergência. [Trabalhos de Conclusão de Curso] Especialização em Informação Científica e Tecnológica em Saúde Instituto de Comunicação e Informação Científica e Tecnológica em Saúde [Internet]. 2016 [acesso em 20 mar 2020]; Fundação Oswaldo Cruz, Rio de Janeiro. Disponível em: https://www.arca.fiocruz.br/handle/icict/37749
11. Nardino J, Pellenz NLK, Müller LA, Andrade A, Arboit ÉL, Camponogara S. Conhecimento de enfermeiros sobre arritmias cardíacas. Ver. Enferm. 2014; 10(10): 1-12
12. Werner K, Kander K, Axelsson C. Electrocardiogram interpretation skills among ambulance nurses. European Journal of Cardiovascular Nursing, 2016;15(4), 262-268. DOI: 10.1177/1474515114566158
13. Vosgerau DSAR, Romanowski JP. Estudos de revisão: implicações conceituais e metodológicas. Rev dial. Edu. [Internet] 2014[acesso em 20 mar 2020];14(41), 165-189. Disponível em: https://periodicos.pucpr.br/index.php/dialogoeducacional/article/view/2317
14. Souza MTD, Silva MDD, Carvalho RD. Revisão integrativa: o que é e como fazer. Einstein. [Internet] 2010 [acesso em 20 mar 2020];8(1), 102-106. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1679-45082010000100102&lng=en&nrm=iso
15. Cavanti ACD, Pereira J. M. V. Nursing diagnoses of patients with heart failure. Online Braz j nursing. 2014 13(1): 113-125. DOI:10.5935/1676-4285.20143916
16. Guimarães DBO, Rodrigues TS, Oliveira SCM, Avelino FVSD. Tempo porta eletrocardiograma em pacientes com dor torácica na emergência. Rev. enferm. UFPE on line [Internet] 2018[acesso em 20 mar 2020];1027-1036. Disponível em: https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/231123/28662
17. Machado MJR, Paes MR, Ribeiro ACG, Segui MLH, Brusamarello T. Heart rhythms at the bed side: cardiology unit nursing team's knowledge. Revista Enfermagem UERJ. [Internet]. 2017 [acesso em 20 mar 2020];25 16137. Disponível em:https://www.e-publicacoes.uerj.br/index.php/enfermagemuerj/article/view/16137
18. Saffi MAL, Bonfada MS. Conhecimento de enfermeiros no manejo e interpretação do eletrocardiograma. Ver. Baian. Enferm. [Internet]. 2018 [acesso em 20 mar 2020]. Disponível em: http://www.revenf.bvs.br/scielo.php?script=sci_arttext&pid=S2178-86502018000100343&lng=pt&nrm=iso
19. Santos LDSFD, Costa RL, Santos PRD, Espindola SP, Bertholy CRDSS, Severiano SGDC, et al. Eletrocardiograma na prática do enfermeiro em urgência e emergência. Nursing Säo Paulo. [Internet]. 2019[acesso em 23 mar 2020]; 2979-2989. Disponível em: http://www.revistanursing.com.br/revistas/253/pg87.pdf
20. Tahboub OYH, Yılmaz ÜD. Nurses Knowledge and Practices of Electrocardiogram Interpretation. International Cardiovascular Research Journal. [Internet]. 2019 [acesso em 20 mar 2020];13(3), 80-84. Disponível em: https://www.researchgate.net/publication/335676616_Nurses'_Knowledge_and_Practices_of_Electrocardiogram_Interpretation
21. Badell MC, Herrera MFJ, Serra ML. Emergency Nurse Competence in Electrocardiographic Interpretation in Spain: A Cross-Sectional Study. Journal of Emergency Nursing. [Internet]. 2017 [acesso em 24 mar 2020];43(6), 560-570. DOI: 10.1016/j.jen.2017.06.001
22. Brooks CA. Kanyok N. O'Rourke C. Albert NM. Retention of baseline electrocardiographic knowledge after a blended-learning course. American Journal of Critical Care. 2016;25(1) 61-67. DOI:10.4037/ajcc2016556
23. Ribeiro DG, Príncipe FP. Conhecimento da equipe de enfermagem de setores críticos na realização e interpretação de eletrocardiograma. Revista Espaço para a Saúde 2020;47-58. DOI:10.22421/15177130-2020v21n1p47
24. Monteiro NO, Marçal DC, Bitencourt IF, Rocha LS, Dias EC. Habilidades dos enfermeiros na realização e interpretação do eletrocardiograma em pronto atendimento. Anais Simpac. 2019;10(1)
25. Barbosa CD. Lima VGI. Rodrigues AA. Magalhães MTM. Vieira FS. Reflexões sobre a pandemia COVID-19 e ações de educação permanente em enfermagem num hospital. Glob Acad Nurs. 2020;1(3):e50. DOI: 10.5935/2675-5602.20200050