THE IMPORTANCE OF THE NURSE IN THE INTERPRETATION OF ELECTROCARDIOGRAM: QUALITY CARE

A IMPORTÂNCIA DO ENFERMEIRO NA INTERPRETAÇÃO DO ELETROCARDIOGRAMA: ASSISTÊNCIA DE QUALIDADE

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ABSTRACT

The electrocardiogram is one of the safest methods to assess heart functionality, because it allows the identification of cardiovascular diseases, changes in coronary flow, as well as cardiac rhythm and conduction abnormalities. The present study aimed to demonstrate and emphasize the importance of nurses in the interpretation of the electrocardiogram. This is a narrative review of the literature, held on BDENF and LILACS, considering full original articles in Portuguese, published in the period 2010-2020. The final sample consisted of 06 articles, being 02 descriptive exploratory and 04 cross-sectional studies, all published in interdisciplinary journals. The studies emphasized how important it is for nurses to have technical and scientific knowledge of the electrocardiogram to make the diagnosis as quickly as possible, improving the patient's prognosis. They also reported the relevance of continual and permanent education for the training of these professionals. The preparation of nursing professionals and their team is essential, so they can provide adequate care to the patient affected by cardiac changes.

Keywords: Electrocardiogram. Emergencies. Nursing care.

RESUMO

O eletrocardiograma é um dos métodos mais seguros para avaliar a funcionalidade do coração, pois permite identificar doenças cardiovasculares, alterações do fluxo coronariano, como também anormalidades do ritmo cardíaco e da condução. O presente estudo teve como objetivo demonstrar e enfatizar a importância do enfermeiro na interpretação do eletrocardiograma. Trata-se de uma revisão narrativa da literatura, realizada na BDENF e LILACS, considerando artigos originais completos, em português, publicados no período de 2010-2020. A amostra final foi composta por 06 artigos, sendo 02 estudos descritivos exploratórios e 04 transversais, todos publicados em revistas interdisciplinares. Os estudos enfatizaram a importância de o enfermeiro ter conhecimento técnico-cientifico sobre o eletrocardiograma para realizar o diagnóstico o mais rápido possível, melhorando o prognóstico do paciente. Relatou-se também a relevância da educação continuada e permanente para capacitação desse profissional. O preparo do profissional de enfermagem e de sua equipe é imprescindível, para que possa oferecer um atendimento adequado ao paciente acometido por alterações cardiológicas.

Palavras-chave: Cuidados de enfermagem. Eletrocardiograma. Emergências.

INTRODUCTION

The electrocardiogram (ECG) is an important test for evaluating heart functionality, since it allows to identify cardiovascular diseases, changes coronary flow, as well as cardiac rhythm and conduction abnormalities. Thus, it is indispensable that the nurse has basic theoretical and practical ECG knowledge to provide immediate quality care, once this health professional takes part in the patient's full and continuous care and is able to decrease morbidity and mortality through the early identification of problems in the cardiovascular system (FERNANDES *et al.*, 2015; LOPES, BARROS, 2016).

Several research studies on ECG were found, but they were mostly targeted to the medical professional. However, the number of studies aiming to analyze the importance of the nurse in performing and interpreting electrocardiographic tracings is still scarce (SANTANA-SANTOS *et al.,* 2017).

Considering that the nurse is the healthcare provider responsible for the patient's continuous care, it demands that s/he masters not only the ECG technique, but also masters the ability to identify previously the need for an immediate ECG, in those patients with chest pain and to plan the type of care that must be provided within a shorter space of time (CAVEIÃO *et al.*, 2014).

Nurses have basic theoretical content on ECG during their undergraduate education. Nevertheless, there are active professionals that have never had access to the subject during their training process. Many take the course Advanced Cardiac Life Support (ACLS), recognized by the American Heart Association (AHA), and still they face difficulties in the electrocardiographic evaluation. Therefore, it is possible to observe a knowledge gap both for those who have taken the AHA course and for those who have never studied about the subject during their academic training (SANTANA-SANTOS *et al.,* 2017).

We assume, then, that ability of the nurse to recognize normal and pathological electrocardiographic tracings is of paramount importance, because this competence may reduce the complications related to cardiac changes, from a stable angina to acute myocardial infarction (AMI), through proper and immediate interventions.

Given the relevance of nursing in the interpretation of the electrocardiogram in cardiac urgencies and emergencies, we ask the following question: What is the importance of the nurse in the interpretation of the electrocardiogram? In this regard, the aim of this study is to demonstrate and emphasize the importance of the nurse in interpreting an electrocardiogram.

METHODOLOGY

To carry out this research study, we performed a narrative review of the literature according to Brum *et al.* (2015), with the following steps: setting up a leading question and our objective, defining the inclusion criteria, searching, and analyzing the articles. The search of articles of interest was conducted on the Nursing Database (*Bases de Dados de Enfermagem* – BDENF) and Latin American and Caribbean Health Sciences Literature (LILACS), through the Virtual Health Library (VHL), held by the Latin American and Caribbean Center on Health Sciences Information (BIREME).

The descriptors in Portuguese chosen for the article search on the mentioned databases were extracted from DeCS (Descriptors on Health Science), searched in October 2020, they were: "electrocardiogram", "nursing care" and "emergencies", and their equivalent terms in English and Spanish. The search was done in the following combination: "electrocardiogram" AND "nursing care" OR "emergencies".

The inclusion criteria included full original articles on those databases, published in the last 10 years, in other words, from 2010 to 2020, written in Portuguese and that showed in the abstract to be pertinent to the search subject.

The exclusion criteria adopted were: full articles unavailable online or non-accessible on libraries to which the researchers had access, literature reviews and articles that did not answer to the leading question established for the research.

At first, an individual search was carried out on the databases and the articles were selected according to the title and abstracts apparently related to the subject. In a second step, there was a confrontation of the articles selected by the authors, excluding the duplicates, and subsequently dividing them for full reading. In the third step, the authors made a review of the fully read articles and those considered to be truly pertinent to the review subject were kept. Therefore, considering the inclusion criteria, the final sample of this literature review was composed of 06 articles, as in Figure 1, found on the databases, 02 articles and 02 books, as a way of complementing the results of the study, once they focused their content on the interpretation of the electrocardiogram by the nurse and through the arguments of authors not found in the research.

DEVELOPMENT

By crossing the descriptors on the databases, 168 articles were identified on LILACS and 16 on BDENF, totaling 173 articles. After analyzing all the titles, 167 were excluded, because they were not related to the theme, they consisted of literature reviews, they were not fully available, they were not in Portuguese, or they were duplicated, and the remaining articles were obtained in their full version. From reading those, 06 articles pertinent to the theme were selected and analyzed for this review.

In relation to the type of study, 02 were exploratory descriptive studies and 03 cross-sectional studies. The studies showed contents related to the theme developed.

Regarding the journal where they were published, all of them were published in interdisciplinary journals in the health area and in electronic journals.

For the development of this study, we used 03 articles and 02 books, as a way of complementing its results, through the arguments of authors not found in the research.

Figure 1 descriptively shows the synthesis of the data extracted from the articles.

Figure 1 - Flowchart of the selection process of the searched articles
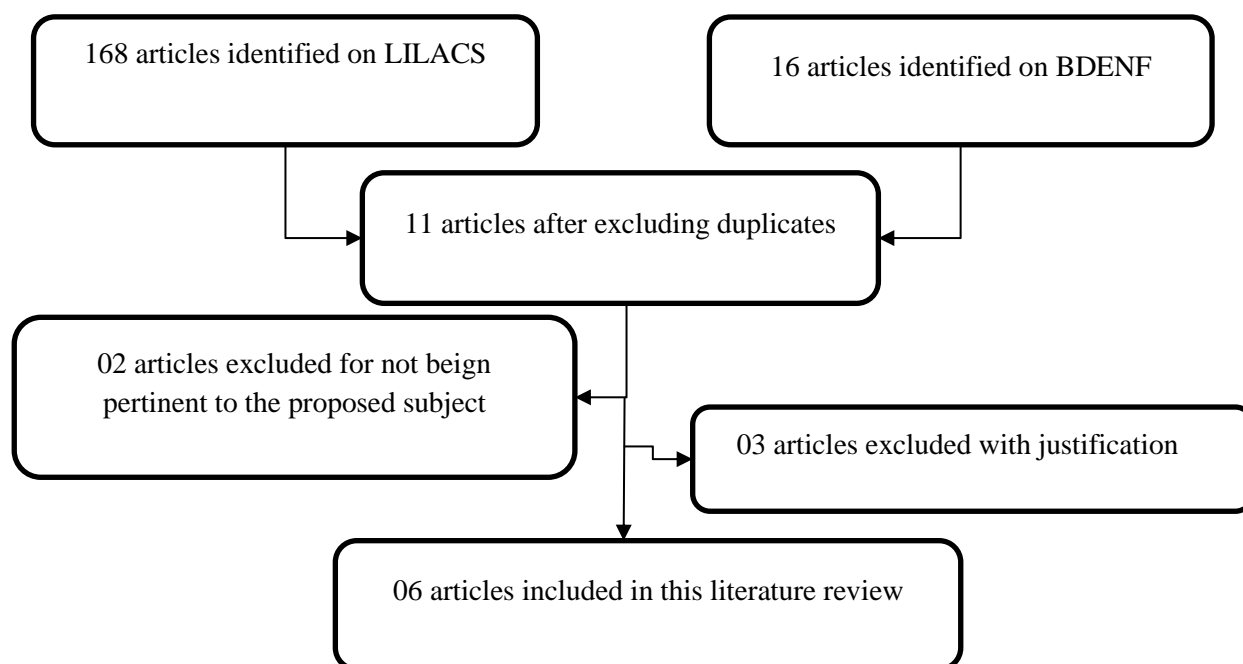
Source: the authors.

Chart 1 - Studies on electrocardiographic interpretation and the role of the nurse, in Brazil, according to author/year, type of publication, title and aims

N.	Type	Title	Aims	Contributions
1	Cross-sectional study	Nurses' theoretical practical knowledge of ECG	Identifying nurses' knowledge of ECG in Recife (PE)	It emphasizes the possibilities of visualizing the particularities of the cardiac muscle and its activities through an ECG, so the nurse can anticipate care, if s/he is properly trained to identify pathological findings in the tracings obtained in the ECG, preventing thus the aggravation of patient's clinical presentation and even death.
2	Cross-sectional study	Nurses' knowledge of ECG management and interpretation	Evaluating nurses' knowledge of ECG basic analysis and interpretation	It highlights that an ECG learning program is key to train nurses to interpreting cardiovascular alterations.
3	Descriptive cross-sectional study with document analysis	Evaluation of the wait time for an initial electrocardiogram in patients with Acute Coronary Syndrome (ACS)	Analyzing the wait time for performing the first electrocardiogram of ACS patients at the emergency room and discussing its implications in the care of these patients	Evaluating the time for performing the ECG as a factor to improve prognosis in patients with ACS and STEMI, highlighting nursing intervention in care.
4	Descriptive exploratory study with a quantitative approach	Door- to-ECG time: evaluation of care to patients with Acute Myocardial Infarction	Measuring the time to perform an electrocardiogram after the admission of a patient with chest pain and investigating the characteristics of the exams and treatment provided to the patient diagnosed with STEMI	It stresses the importance of the nurse's proper training in ECGs and the implementation of protocols of care to the patient with chest pain.
5	Descriptive exploratory study with a quantitative approach	Chest pain: The work of the nurse at an emergency care unit of a school hospital	Identifying the work of the nurse with a patient with chest pain at an emergency care unit	The nurse must have technical scientific knowledge to provide care to the patient with chest pain.
6	Cross-sectional study	Nurses' abilities to interpreting the 12-lead electrocardiogram	Evaluating nurses' ability to recognizing immediate intervention electrocardiographic alterations and comparing their work in case of arrhythmias	It demonstrates the factors that interfere in the fast interpretation of ECG alterations by the nurse.

Source: the authors.

According to Fernandes *et al.* (2015), the electrocardiogram is a low-cost, safe, and fast method that evaluates any abnormality in the cardiac rhythm, it is also able to monitor any device which is implanted in the heart, such as a pacemaker. Although, since its first registry, several improvements have been made, the 12-lead ECG still prevails.

Technical mistakes while performing the ECG, such as patient's movement, chest asymmetry, inappropriate calibration of the ECG equipment, electromagnetic interferences, wrong electrode placement, poor contact with the skin or tremors, may lead to significant changes in the

electrocardiographic report, resulting in misdiagnoses, such as wave inversions suggesting infarction or alterations that may simulate arrhythmias. In order to avoid alterations, the placement technique is fundamental (FERNANDES *et al.,* 2015).

Fernandes *et al.* (2015) showed in their study that, while performing an ECG, the highest index of hits was related to the technique and the lowest index of hits was the position of precordial electrodes.

In accordance with Lopes and Barros (2016, p. 383):

> The standard electrocardiogram is composed of 12 leads, six are peripheral (DI, DII, DIII, aVF, aVL, aVR) and six precordial (V1, V2, V3, V4, V5, and V6). In special situations, one may complement the exam using other leads, such as those analyzing the right ventricle (V3r to V6r) and the posterior wall of the left ventricle (V7 and V8). Peripheral leads are obtained in the frontal plane, through the placement of three electrodes, one on each arm (right/left) and one on the left leg. Precordial (unipolar) leads, in turn, are obtained in the horizontal plane, through the placement of electrodes on the patient's chest. (Our translation)

The guidelines recommend to perform the 12-lead ECG to reveal pathological findings in individuals showing clinical signs that indicate such alteration. These leads allow to visualize the heart from many angles; therefore, it is essential that the nurse knows the heart physiology to identify alterations, making the autonomy of the nursing professional possible to provide quality care (SAFFI; BONFADA, 2018).

According to Caveião *et al.* (2014), in their descriptive exploratory study with a qualitative approach, they reported that, after having interviewed some nurses, five nurses characterized precordial chest pain and irradiation to the mandible as the first symptoms, six performed cardiac monitoring and eight asked for an ECG, demonstrating the importance of the adoption of a protocol to standardize the care, as well as their fast and agile action in patients affected by myocardial infarction. They highlighted that the nurse should have the knowledge of clinical manifestations in time to intervene, delivering nursing care.

Still in Caveião *et al.* (2014), in regard to the action of the nurse in their profession, it is possible to notice that the welcome of patients with signs and symptoms of AMI is immediately addressed. However, not every professional conducts the history and the clinical examination in the patient. They observed that it is difficult for nurses to recognize the characteristics of chest pain, as well as the clinical manifestations, increasing door-to-ECG time.

For Fernandes *et al*. (2015), the nurse is the professional responsible for planning and providing continuous full care to the patient, implicating in a quality nursing care, for this reason, it is also necessary that the nurse knowns to perform ECG techniques, as well as having the capacity to identify previously, within the minimal space of time, cardiac alterations that could lead to patient's health damages and, in consequence, decreasing several complications resulting from arrhythmias, anginas, heart failure, in addition to metabolic and inflammatory heart disorders (LEMOS; TOMAZ; BORGES, 2010).

According to Oliveira (2016), the nurse bears the responsibility for delegating and performing ECG, as well as making the decision of performing it immediately in patients with clinical manifestations suggestive of ACS. The earlier the ACS is detected, especially STEMI, the better will be the survival of the heart muscle, avoiding the damages caused by inappropriate blood flow.

A study conducted at a general hospital in Porto Alegre - RS showed that the door-to-ECG time was 20 minutes, much longer than what the Brazilian Society of Cardiology recommends, which is 5 -10 minutes after the arrival at the hospital; thus, the study showed delays in door-to-ECG and door-to-needle time. In view of this fact, the study presented a strategy that produced changes, where delays in door-to-ECG and door-to-needle time start to focus on the action of specialist nurses for requesting and performing the exam, establishing proper communication with the nursing and medical team for a fast and adequate action given the situation and for recognizing acute myocardial infarction (AMI) after the ECG evaluation (MACHADO *et al.,* 2017)

Palmeira and Machado *et al.* (2017), in their study, reported that to be successful in the treatment of AMI patients it is indispensable that interventions are made as soon as possible, decreasing mortality in up to 50%. The ECG reduces cardiac complications and deaths in patients with ST-segment elevation myocardial infarction (STEMI), for this reason, it relies on rapidly performing an ECG, as well as on its evaluation, highlighting the importance of its reading by non-medical healthcare providers.

According to a research study that checked the wait time for performing an ECG, at an emergency room of a private hospital in the city of Rio de Janeiro, the wait time was 22 minutes for patients with suspicion of ACS, but for STEMI cases, the wait time was 7.5 minutes. Performing an ECG in a timely manner in STEMI patients decreases mortality, because it precedes a successful reperfusion therapy, once the nurse is the professional who has a major role to ensure that the ECG ideal time is met, which is 5 to 10 minutes for patients with suspicion of AMI. This care must be delivered through systematization of protocols and management of the best care in their units (ANDRADE *et al.,* 2015).

The shortest time for applying procedures, in AMI patients, results in a successful therapy; therefore, there is the need for the nurse to master the reading of tracings based on the knowledge acquired though training and implementation of protocols driving this type of care (PALMEIRA; MACHADO, 2011).

The efficacy and efficiency of reperfusion decrease as the time of decision for performing fibrinolytic therapy and for the arrival of the STEMI patient at the hospital increases. As a result, it is crucial the recognition of such alteration in the ECG, within the lowest space of time, in addition to the promptness in decision making (PALMEIRA; MACHADO, 2011).

Keeping in mind that nurses should carry out the first procedures, they should act promptly, effectively, with a lot of concentration and high quality, so once the grade of severity of the chest pain is established, the exams can be performed (CAVEIÃO *et al.,* 2014).

Even if nurses demonstrate capacity for interpretation in cardiorespiratory arrest and in some cardiac arrhythmias, they still show difficulty in identifying alterations related to acute myocardial infarction, only those who perform those readings in their routine show greater ability to interpret an ECG (SANTANA-SANTOS *et al.,* 2017).

In their study, Saffi and Bonfada (2018) stressed the low frequency of opportunities of ECG trainings for nurses offered by the institution. They also pointed out in their research that less than 50% of nurses recognized ECG alterations such as fibrillation. The authors reported that it is paramount that the nurse knows the cardiovascular physiology to recognize arrhythmias. Nurses' knowledge enhanced after education programs, specialized trainings, and interventions, leading to the improvement of skills with safety and quality in ECG interpretation.

Machado *et al.* (2017) reported in a study held in the cardiology unit of the university hospital of Curitiba-PR that the nursing team relies on the nurse professional as a reference to electrocardiographic interpretation.

In urgency/emergency units, the interventions made by nurses in AMI users are limited due to low level of knowledge where the situation requires promptness in making scientifically supported decisions. The delay of interventions causes the increase of severity of the patient's clinical picture and imminent risk of death. The ECG is an exam of great importance for the diagnosis of AMI, what emphasizes the need for training programs designed to nursing professionals to improve quality care (ALVES *et al.,* 2011).

A study conducted by Machado *et al.* (2017) reported the importance of promptness in the interventions made by the nurse given the electrocardiographic alterations and it stated that the knowledge to identify findings in the tracings is essential for the development of higher effective care to these patients. Although the authors admit the importance of knowledge to identify alterations in cardiac rhythms, there is a deficiency concerning this issue in the nursing team, and those who demonstrate this knowledge have acquired it in a daily basis experience. In view of their report, it

was recommended that the institution implemented a permanent education program to improve the care delivered by professionals in cardiac emergencies.

For a fast effective care, it is necessary to acquire a combination of technical and scientific knowledge, to make it possible to prevent patients from suffering unnecessarily or preventing even death. Understating that the nurse is the one who provides continuous care, it is indispensable that s/he is constantly updated through their participation in continual education trainings proposed by their service as well as in the planning of these activities (CAVEIÃO *et al.,* 2014).

Our study had some limitations once there were few articles related to the subject addressed, showing the fragility of this thematic. However, the authors expect that the present review may contribute to the development of further studies on this subject.

CONCLUSION

The present study allowed to conclude about the importance of the nurse in the interpretation of the electrocardiogram, both in performing the reading and identifying altered tracings, as well as in knowing the equipment, the technique and the various factors that interfere in the quality of the exam; once the technical scientific knowledge enables the delivery of full continuous care to the patient, always aiming to anticipate for a better prognosis and for preventing possible damages.

It also highlights the importance of the proper timing for performing an ECG, recommended by the Brazilian Society of Cardiology, once the promptness and decision making for the early administration of fibrinolytic drugs are time-determining of the ECG diagnosis; making it possible to obtain a better result from the reperfusion therapy, sparing the patient from myocardial suffering in addition to emotional suffering, exposing the patient to procedures that could have been avoided, after-effects or even death.

Therefore, the preparation of the nursing professional and their team is vital to offer proper care to the patient affected by cardiologic alterations. They should participate in continual and permanent education programs related to the subject, making the most of the information from different areas of knowledge, interdisciplinary and interdepartmental discussions to support and improve the practice.

Furthermore, we suggest the creation of a protocol in Brazil that authorizes properly trained non-medical professionals to interpret ECGs in urgency and emergency situation with the purpose of decreasing morbidity and mortality and possible complications. In addition to the adoption of new strategies, such as the request for an ECG by the nurse professional to reduce door-to-ECG time, so better therapeutic effects can be obtained in myocardial infarction.

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