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Knowledge of Nurses about Electrocardiography Basics

Conhecimento de Enfermeiros sobre Noções Básicas de Eletrocardiografia
Conocimiento de Enfermeros sobre los Fundamentos de la Electrocardiografía

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ABSTRACT

Objective: to verify nurses' knowledge about electrophysiology and notions of electrocardiogram interpretation. **Method:** observational, cross-sectional, analytical, quantitative study carried out in a hospital in the Brazilian Midwest. Non-probabilistic sample consisted of nurses working at the hospital. For data collection, a knowledge assessment questionnaire was designed and validated. Simple frequency and central tendency and dispersion analyzes were performed, adopting the chi-square test, with a significance level of 5%. **Results:** 20 nurses participated in the study, most of them female, with a mean age of 34.6 years. It was possible to identify a deficit in the nurses' knowledge about electrophysiology and notions of electrocardiogram, however, those professionals who took refresher courses on the subject had a greater number of correct answers. **Conclusion:** there were weaknesses of nurses with regard to knowledge about electrophysiology, identification of physiological and pathological electrocardiographic tracings.

DESCRIPTORS: Knowledge; Nursing; Eletrocardiography; Critical care; Education, Nusing.

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RESUMO

Objetivo: verificar o conhecimento de enfermeiros sobre eletrofisiologia e noções de interpretação do eletrocardiograma. Método: estudo observacional, transversal, analítico, quantitativo, realizado em um hospital do centro-oeste brasileiro. Amostra não probabilística foi constituída por enfermeiros atuantes no referido hospital. Para a coleta de dados foi elaborado e validado o questionário de averiguação do conhecimento. Foram realizadas análises de frequência simples e de tendência central e dispersão, adotando-se o teste qui-quadrado, com nível de significância de 5%. **Resultados:** participaram do estudo 20 enfermeiros, a maioria do sexo feminino, com média de idade de 34,6 anos. Foi possível identificar déficit no conhecimento dos enfermeiros sobre eletrofisiologia e noções de eletrocardiograma, entretanto, aqueles profissionais que realizaram cursos de atualização sobre a temática obtiveram níveis mais elevados de conhecimentos sobre o assunto. **Conclusão:** verificaram-se fragilidades dos enfermeiros no que se refere ao conhecimento sobre eletrofisiologia, identificação de traçados eletrocardiográficos fisiológicos e patológicos.

DESCRITORES: Conhecimento; Enfermagem; Eletrocardiograma; Cuidados críticos; Educação em enfermagem.

RESUMEN

Objetivo: verificar los conocimientos de las enfermeras sobre electrofisiología y nociones de interpretación de electrocardiogramas. Método: estudio observacional, transversal, analítico y cuantitativo realizado en un hospital del Medio Oeste brasileño. La muestra no probabilística estuvo constituida por enfermeras que laboran en el hospital. Para la recolección de datos, se diseñó y validó un cuestionario de evaluación de conocimientos. Se realizaron análisis de frecuencia simple y tendencia central y dispersión, adoptando la prueba de chi-cuadrado, con un nivel de significancia del 5%. **Resultados:** participaron del estudio 20 enfermeras, la mayoría mujeres, con una edad media de 34,6 años. Se pudo identificar un déficit en el conocimiento de los enfermeros sobre electrofisiología y nociones de electrocardiograma, sin embargo, aquellos profesionales que realizaron cursos de actualización en el tema tuvieron mayor número de respuestas correctas. **Conclusión:** existían debilidades del enfermero en cuanto a conocimientos sobre electrofisiología, identificación de trazados electrocardiográficos fisiológicos y patológicos.

DESCRIPTORES: Conocimiento; Enfermería; Eletrocardiografía; Cuidados críticos; Educación en Enfemería.

INTRODUCTION

The number of people diagnosed with cardiovascular disease has been increasing in the last 10 years, being responsible for 70% of all deaths worldwide and, proportionally, increasing the number of admissions in hospitals due to its complications, becoming the leading cause of death worldwide.[1] Patients in this condition require intensive and continuous monitoring by trained professionals, during the period of disease aggravation, in order to anticipate risk situations and thus allow interventions to be performed in a timely, appropriate and appropriate manner.

Thus, continuous cardiac monitoring and electrocardiography are considered hard technologies, important for effective and safe assessment of individuals who have some conduction disorder of the electrical activity of the heart. The need for adequate handling of these technologies has become indispensable for the nursing team, since these professionals are responsible for uninterrupted care.[2]

The nurse is considered to be one of the main players in the care process, and is responsible for the quality of all the processes that involve care management, especially with regard to the procedures to be performed on the patients under his/her care.

Regarding the specialized work in units that serve patients with heart diseases, the nurse must be able to recognize physiological and pathological electrocardiographic tracings, ensuring efficient and safe cardiac monitoring, preventing complications related to conduction disorders, and assisting in the decision-making process.[3–5]

Nurses must be able to recognize the importance of scientific knowledge about cardiac anatomy and physiology for a fast and reliable interpretation of the electrocardiographic tracing, which will reflect in early and assertive decision making.[6] Taking into consideration that the longer the time taken for the correct identification of potential arrhythmic conditions, the worse the prognosis of such patients, which may even result in their mortality.[7]

Given the above, and in view of the scarcity of studies related to the topic, the development of this study was considered pertinent, guided by the following guiding question: "What is the knowledge of nurses working in a cardiology referral hospital about notions of electrocardiography?" Thus, this study was proposed to verify the knowledge of nursing caregivers about electrophysiology and notions of electrocardiogram interpretation.

METHOD

This is an observational, cross-sectional, analytical study, with quantitative approach, conducted in a public hospital, a reference in cardiology, in a city in the interior of the state of Mato Grosso, in the central-western region of Brazil. This institution offers cardiology care to 19 municipalities in the southern region of the state of Mato Grosso. It has two adult intensive care units, one of which is exclusively for patients with heart diseases and postoperative of cardiovascular surgeries.

The institution where the data were collected has 14 coordinating nurses and 101 caregiver nurses, 7 of whom are away due to illness, vacation or maternity leave. However, a non-probabilistic

sample, by convenience, was composed of caregiver nurses who worked in sectors that admitted patients with heart diseases in clinical or surgical treatment, including non-critical (wards) and critical (intensive care unit) units, places with recognized demand for performing electrocardiographic examination due to the severity of some cases.

To record the information, we used an instrument consisting of 35 items aiming to characterize the participants and assess their knowledge about cardiac electrophysiology, purpose of the electrocardiogram, technique/position of the electrodes and interpretation of the electrophysiological tracing. The instrument is divided into 3 components, the first with items related to the socio demographic, academic and professional profile of the participants, the second with items focused on the knowledge about performing the electrocardiogram, and the third component related to the knowledge about the interpretation of the electrocardiogram and identification of arrhythmias.

The questionnaire was structured in three axes, namely: axis A (item 1 to item 14) for the verification of sociodemographic, academic and professional characteristics, consisting of open items, only for the participants to fill out; component B (item 15 to item 19) and component C (item 20 to item 35), consisting of multiple choice questions for the evaluation of the last two components, considering adequate knowledge those who got the most items right.

The instrument used underwent face and content validation by a committee of judges, composed of professionals with experience in the clinical area of cardiac electrophysiology, in the area of nursing education and with the validation of instruments. Obtaining the total content validity index (CVI) of 0.90 of agreement between the judges about the questionnaire items, evaluating the pertinence, relevance and clarity of each item.[8–9]

A non-probabilistic and consecutive sample was composed of professionals working in the aforementioned hospital in sectors that offered care to patients with heart disease and that periodically performed electrocardiograms. Data collection occurred in January and February 2020, after reading and signing the Informed Consent Form (ICF) by the participants. All nurses of the previously referenced sectors were interviewed, in both shifts (day and night), the professionals selected to participate in the study were allocated in critical units and in non-critical units, being excluded those who were away for reasons (pregnancy, illness, vacation or other).

Data collection occurred in the institution itself, with date and time previously scheduled by the researchers and in a reserved environment for completing the questionnaire. The questionnaires were self-applied, and at the end of the questionnaire each participant put the answered questionnaire in an envelope, and then he himself sealed the envelope in order to guarantee anonymity.

The data were stored in the Statistical Package for the Social Sciences (SPSS) version 20.0 statistical program, using double typing to enable the verification of potential inconsistencies during the creation of the database.

For data analysis we carried out descriptive analyses of simple frequency for categorical variables, of central tendency (mean, minimum and maximum) and dispersion (standard deviation) for continuous variables, with a 95% confidence interval. Pearson's chi-square test (X^2) was used to verify the existence of an association between the dependent and independent variables. A 5% significance level was adopted.

This study respected the ethical precepts of Resolution 466/12 of the National Health Council, guaranteeing the anonymity of each professional. In the first moment, the assistance management of the studied institution was presented and its agreement was conceived; after that, the project was submitted to the ethics in research committee, obtaining a favorable opinion for the beginning of the research, under number 3.633.786 and Certification of Ethics Presentation and Appreciation (CAAE) number 21607819.8.0000.8088.

RESULTS

All the 20 care nurses who work at the institution participated in the research. Table 1 shows the sociodemographic, academic and professional data of the interviewees.

Regarding the academic background profile of these professionals, it was found that the sample was composed of professionals of both genders, with a mean age above 30 years, 45% have only an undergraduate degree and 55% have a lato sensu postgraduate degree in areas related to the study or related areas, of these, five in Intensive Care Unit, two in Emergency and Urgent Care, one in Surgical Center, one in Auditing, one in Cardiology and Hemodynamics and one in Adult and Elderly Health.

Regarding the time elapsed after graduation, an average of a little more than six years was obtained, with a minimum of 2 years and a maximum of 17 years.

Regarding the specific knowledge on electrocardiography, most participants (70%) reported that the basics of electrocardiography were part of the curricular component of the undergraduate course. Among the nurses who reported having specialization, six professionals reported that the subject was covered in the curricular component of lato sensu post-graduation courses. When asked about the participation in courses on performance and interpretation of electrocardiographic tests for nurses, only three nurses replied to have taken courses, of these, one in the theoretical modality and two with theoretical and practical approach.

Regarding the periodic performance of the electrocardiogram exam, only 45% of the professionals replied that they perform the exam periodically, of these, 30% said they perform it three to five times a day, and 15% said they perform it more than five times a day.

As shown in Table 2, it could be verified that when the variables related to the knowledge about basic electrophysiology and training were related, an association was identified between the knowledge about the steps to perform the exam and the

Table 1- Socio-demographic, academic, and professional characterization of the participants, Rondonópolis, MT, Brazil, 2020

Itens	n (%)	Average (DP)*
Gender		
Female	11 (55%)	
Male	9 (45%)	
Age (in complete years)		34,6 (DP:6,71)
Education level		
Undergraduate	9 (45%)	
Specialization	11 (55%)	
Graduation Ending (in completed years)		6,5 (DP:3,50)
Notions of electrocardiography in graduation		
Yes	14 (70%)	
No	6 (30%)	
Notions of electrocardiography in graduate studies (n=11)		
Yes	4 (36%)	
No	7 (74%)	
Conducted a refresher course in basic notions of electrocardiography		
Yes	3 (15%)	
No	17 (85%)	
Sector of activity in the institution		
Critical Care Unit (ICU)	8 (40%)	
Non-critical Unit (Infirmaries)	12 (60%)	
Experience in the Nursing field (in years)		1,45 (DP:2,37)
Performs the electrocardiogram exam daily in the sector where he works.		
Yes	9 (45%)	
No	11 (55%)	
Frequency of electrocardiographic exams per shift (in quantity of exams) (n=9)		
From 1 to 3 time	6 (67%)	
More than 5 times	3 (33%)	

Mean (DP)*: Mean (Standard deviation).

completion of a course about the basics of electrocardiography ($p = 0.015$). With reference to the concept of cardiac arrhythmia, there was a statistically significant relationship ($p = 0.024$) when related to the knowledge acquired during the undergraduate training.

Regarding the identification of waves that make up the physiological electrocardiographic tracing, it was possible to verify an association between the P wave ($p = 0.001$) and the T wave ($p = 0.015$), with the completion of refresher courses on the subject.

Regarding the knowledge related to the interpretation of electrocardiographic tracings in physiological and pathological conditions, highlighted in Table 3, it was possible to identify the association between arrhythmic conditions (Atrioventricular block, Atrial Fibrillation, Ventricular Fibrillation, Ventricular

Tachycardia and Acute Myocardial Infarction with supra-ST segment elevation) and the completion of refresher courses focused on the basics of electrocardiography.

Also according to the data reported in Table 3, it was possible to see that specialization courses, especially those taken in the area under study, and refresher courses have a statistically significant association with asystole recognition ($p = 0.027$ and $p = 0.038$), as well as sinus rhythm also showed an association with refresher courses (p-value = 0.001).

DISCUSSION

The number of studies addressing the issue of nurses' knowledge in analyzing electrophysiological tracings, as well as their knowledge regarding basic cardiac electrophysiology is still scarce,[10–11] this research emerges as a strategy to address this lack in the literature.

In this study it was observed that few participants reported participating in courses aimed at the basics of electrocardiography (85%), corroborating other studies that brought the same findings about the interest of nursing professionals in professional training in order to match theory and practice.[6,12] It is believed that the restricted search for training of the sample studied may be related to the difficult understanding of the relationship between the simultaneous activities of mechanical and electrical functions of the heart.[6]

The correct and fast ECG interpretation is associated with a greater safety in the nurses' practices, thus generating positive results in the care. Nurses, regardless of their professional experience, if well qualified, are able to identify ECG rhythms, enabling the adoption of appropriate and immediate interventions.[3,13]

Corroborating the data found in this study, a survey carried out at a university hospital in the northeast of Brazil found that nurses had low knowledge about the basics of electrocardiography.[10] Another study carried out at a hospital in southern Brazil revealed that nurses have difficulties in identifying sinus electrocardiographic tracings, STEMI and atrioventricular block.[6]

Conceptually, the steps to evaluate the electrocardiographic tracing are: verification of the rhythm, measurement of the heart rate from the tracing, identification and verification of the amplitude and duration of the waves and complexes.[10] In agreement with the results exposed by this investigation, studies found in the literature show that 80% of the nurses were not able to correctly identify the P and T waves, and the QRS complex in the electrocardiographic tracing,[6] and in another study, only 25% of the interviewees correctly knew the meaning of the QRS complex.[10]

This fact can be justified in the approaches of educational interventions, focused strictly on the identification of arrhythmias, neglecting the understanding of cardiac structures and their functioning. According to the approach used in the different types of courses (theoretical, theoretical-practical or only practical), the knowledge must be significant for the nurse's care practice.[14]

North American authors compared the nurses' knowledge by means of a questionnaire before and after educational interven-

Table 2 - Characterization of the data related to nurses' knowledge about the principles of basic electrophysiology, Rondonópolis, MT, Brazil, 2020

Itens	Notions of ECG in graduation n = 20			Notions of ECG in graduate studies n = 11			Update on Notions of ECG n = 20		
	Yes	No	*p-value*	Yes	No	*p-value*	Yes	No	*p-value*
20. What are the main steps in evaluating an electrocardiogram?			0,117*			0,376*			**0,015***
Hit	0%	5%		0%	9%		5%	0%	
Error	70%	25%		36%	55%		10%	85%	
21. Where does the electrical impulse begin?			0,831*			0,651*			0,891*
Hit	20%	10%		9%	27%		5%	25%	
Error	50%	20%		27%	37%		10%	60%	
22. What is cardiac arrhythmia?			**0,024***			0,153*			0,413*
Hit	20%	5%		27%	37%		10%	35%	
Error	50%	25%		9%	27%		5%	50%	
23. Identification of waves in the electrophysiological tracing?			0,807*			0,100*			**0,001***
Hit	15%	5%		9%	27%		15%	5%	
Error	55%	25%		27%	37%		0%	80%	
24. What does the *P*-wave represent?			0,515*			0,343*			**0,001***
Hit	15%	5%		9%	9%		10%	0%	
Error	55%	25%		27%	55%		5%	85%	
25. What does the T-wave represent?			0,502*			0,122*			**0,015***
Hit	15%	0%		9%	0%		5%	0%	
Error	55%	30%		27%	64%		10%	85%	
26. What does the QRS complex represent?			0,329*			0,409*			0,144*
Hit	10%	0%		9%	0%		5%	5%	
Error	60%	30%		27%	64%		10%	80%	

* p-value by Pearson's Chi-square.

tions and noticed an improvement in the scores in relation to the interpretation of these professionals with respect to electrocardiographic tracings.[15] In a multicenter study carried out in China, the United States and Canada, it was noted that after training, the accuracy of nurses in relation to the correct identification of electrocardiographic tracings increased from 82% to 97%.[16]

It was possible to notice an association between training on ECG and the cognitive competence of professionals in the appropriate identification of electrocardiographic tracings, and it is of paramount importance that in the nursing area there is a periodic training program focused on this subject, since the literature shows that it can increase by up to five times the chance of a correct identification of the tracings.[3,10,17–18]

Previous investigations[6–7,13] have shown that less than 50% of the participating nurses can identify ventricular fibrillation and acute myocardial infarction, and these rhythms are extremely important in the context of nursing professional clinical practice

because ventricular fibrillation requires quick decision making when the patient is in cardiorespiratory arrest, requiring immediate cardiopulmonary resuscitation maneuvers and defibrillation for sinus rhythm recovery.[19] In Acute Myocardial Infarction, the electrocardiographic tracing generally presents alteration in the ST segment, leaving it widened with supra- or infra- leveling in the acute phase of the ischemic event, the nurse should enter into consensus with the physician for the institution of specific therapy and early intervention, because the longer the time elapsed without intervention, the greater the tissue damage in cardiac muscles.[19] This information corroborates the data exposed by this research.

The study limitations are related to establishing the sample by convenience and conducting the study in only one hospital institution, due to the search for participants nurses working in sectors that periodically perform the test, a specific characteristic of the hospital in question, since the institution is a reference in

Table 3 - Characterization of data related to the interpretation of electrocardiographic tracings, Rondonópolis, MT, Brazil, 2020

Itens	Notions of ECG in graduation n = 20			Notions of ECG in graduate studies n = 11			Update on Notions of ECG n = 20		
	Yes	No	*p-value*	Yes	No	*p-value*	Yes	No	*p-value*
27. Tracing corresponding to sinus bradycardia.			0,515*			0,127*			0,144*
Hit	5%	5%		0%	18%		5%	5%	
Error	65%	25%		37%	45%		10%	80%	
28. Tracing corresponding to Sinus Tachycardia.			0,201*			0,651*			0,133*
Hit	15%	15%		9%	27%		10%	20%	
Error	55%	15%		27%	37%		5%	65%	
29. Tracing corresponding to AVB*			0,891*			0,066*			**0,007***
Hit	10%	5%		18%	9%		10%	5%	
Error	60%	25%		18%	55%		5%	65%	
30. Tracing corresponding to AF*			0,891*			0,809*			**0,007***
Hit	10%	5%		9%	9%		10%	5%	
Error	60%	25%		27%	55%		5%	65%	
31. Trace corresponding to VF*			0,515*			0,343*			**0,001***
Hit	5%	5%		9%	9%		10%	0%	
Error	65%	25%		27%	55%		5%	85%	
32. Plot corresponding to VT*.			0,573*			0,959*			**0,001***
Hit	15%	10%		9%	18%		15%	10%	
Error	55%	20%		27%	46%		0%	75%	
33. Tracing corresponding to IAMCSST*.			0,891*			0,233*			**0,001***
Hit	10%	5%		9%	18%		15%	0%	
Error	60%	25%		27%	46%		0%	85%	
34. Tracing corresponding to Asystole.			0,202*			**0,027***			0,038*
Hit	25%	20%		9%	55%		15%	30%	
Error	45%	10%		27%	9%		0%	55%	
35. Trace corresponding to Sinus Rhythm.			0,573*			0,347*			**0,001***
Hit	20%	5%		9%	27%		15%	10%	
Error	50%	25%		27%	37%		0%	75%	

* Pearson's Chi-square p value; AVB: atrioventricular block; AF: atrial fibrillation; VF: ventricular fibrillation; VT: Ventricular tachycardia; STEMI: Acute Myocardial Infarction with ST-segment elevation.

the care of heart disease patients in the southern region of the state of Mato Grosso, Brazil.

This study brings an important contribution in the single-professional perspective by highlighting the restricted knowledge of nurses assistants on basics of electrocardiography. From the findings it became imperative to state that training and continuing education are driving springs for the implementation of nursing care in search of offering an increasingly qualified care.

CONCLUSION

The present study showed that nurses had restricted knowledge regarding electrophysiology of the heart; however, those professionals who took refresher courses demonstrated ease in recognizing the most common cardiac arrhythmias, which reinforces the need for nurses to have basic knowledge about electrophysiology, in order to enable the accurate identification of conduction arrhythmias or formation of the electrical impulse.

It is expected that these results will help in the elaboration of training and updating programs (theoretical and practical) for the nursing professionals of this institution, since it is a reference in cardiologic assistance for 19 cities.

It is emphasized the importance of the need for further studies to evaluate this theme and the variables that may influence their knowledge, taking into account that the nurse is one of the professionals of the care team that remains uninterruptedly next to the patient.

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