



Interpretation of ECG among Nurses-A Review

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ABSTRACT

The electrocardiogram (ECG) is a simple, quick, and non-invasive cardiac test that can detect irregular heartbeats and diagnose a variety of heart conditions. To identify the evidence about the interventions to increase the knowledge of staff nurses regarding the interpretation of ECG. The Survey Review method was adopted and Researchgate.net; PubMed; CINHL, Google Scholars, and Scopus Database were used. Studies included that involved registered nurses and studies published between Jan. 2018 to Dec.2022. Studies excluded other than registered nurses and other than between Jan. 2018 to Dec. 2022. Thirteen of Twenty-one studies met the criteria for inclusion. The findings indicate that: Two studies have shown that nursing staff members have gaps in their understanding of ECG interpretation.

Keywords: ECG, interpretation, arrhythmia, nurses, knowledge, practice, competence. ICU.CCU.EDs.

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INTRODUCTION

The electrocardiogram (ECG) is an easy-to-use, non-invasive cardiac test that can detect irregular heartbeats and other heart conditions. In patients with coronary artery disease, it is instrumental in lowering the risk of hospitalization and death. In intensive care units, nurses are accountable for both observation and interpretation¹. An electrocardiogram (ECG) is a vital tool for the diagnosis of heart conditions such as myocardial infarction (MI) (AHA 2018). It has been said that nurses are frequently found in "frontline" positions in hospitals and are the ones to perform initial patient assessments. Therefore, nurses must be able to perform and interpret an electrocardiogram in the event of a patient experiencing a heart attack or other cardiac problem².

According to reports, hospital work units influenced ECG understanding and application. Researchers Zhang et al. found that nurses in the cardiology department had higher test scores than their counterparts in the ED and the ICU (ICU). According to another study conducted in Iraq, the vast majority of CCU, ICU, and ED nurses were able to correctly answer all knowledge-based questions except those pertaining to ECG alterations about new and old myocardial infarction. This indicated that more work was needed in the practical application section, necessitating more advanced training⁴. Even though the electrocardiogram (ECG) is a potent diagnostic tool and a crucial health indicator, studies have demonstrated that incorrect clinical judgments can be made based on inaccurate interpretations of ECG results. It's happening with increasing frequency to nurses, raising concerns about the importance of continuing education in this field. Moreover, the need for this study was prompted by the scarcity of well-known studies addressing the role of nursing in ECG interpretation and their competency, especially in Palestine. This study is essential because it assesses RNs' abilities to interpret life-threatening and non-life-threatening ECGs and the primary ECG parameters, which is crucial in emergencies and in preventing further complications from a cardiac issue that has been diagnosed in a patient⁶. The ability of doctors, nurses, and emergency personnel to record and interpret electrocardiograms (ECGs) to diagnose pathological disorders is crucial for reducing the prevalence of heart disease and related mortality. The ability to correctly interpret electrocardiograms is crucial for emergency nurses and other EMS workers who treat patients in critical situations of ECG¹². To identify the evidence about the interventions to increase the knowledge of staff nurses regarding the interpretation of ECG.

MATERIAL AND METHODS

From the period January 2018 through December 2022, only 13 of the 21 studies that met the inclusion criteria were included in the analysis.

Method: The Survey Review method was adopted and Researchgate.net; PubMed; CINHL Database were used.

Inclusion criteria: Studies included that involved registered nurses and studies published between January 2018 to Dec.2022.

Exclusion criteria: Studies excluded other than registered nurses and other than between Jan. 2018 to Dec. 2022.

Four separate studies arrived at the same conclusion: there is a gap in understanding. seven studies found an increase in staff nurses' knowledge after educational programs, as well as a correlation between nurses' present practices and their prior work experiences. Based on the results of 2 studies, nurses have a solid grasp of ECG interpretation.

RESULT AND DISCUSSION

The results of the review of the survey indicate the importance of educational programs aimed at improving the knowledge, practice, and competence of nursing staff to enhance patient management and outcomes.

Qaddumi Jet al., 2019. This study found that RNs working in public hospitals were better able to determine the type of arrhythmia based on the ECG figure than RNs working in private hospitals, but they were less proficient at interpreting primary ECG parameters. While registered nurses in public hospitals can interpret some basic ECG parameters, such as heart rate and rhythm, private hospital RNs are far more competent in this area. It was determined from this study that private and public hospitals have different standards for nurse ECG interpretation competence⁶.

Al-Ahdal SA et al., 2020. There is a statistically significant correlation between nurses' education and their knowledge ($P = 0.000$) but no correlation between nurses' experience and their knowledge ($P = 0.118$). Thus, there is no correlation between education and years of experience in nursing P . Value = 0.901; Value = 0.717. More effort to increase knowledge and practice is not required if the current level of expertise is sufficient. 10 out of 6 studies found an increase in staff nurses' knowledge after education and training programs and found an association between nurses' knowledge and their actual practises¹⁰.

Nabil Malk Ret al., 2018. The study showed that the majority of nurses in this study had subpar electrocardiography knowledge and skills before the introduction of the training program ($p 0.001$), and while they significantly improved during the first three months of the program, their performance deteriorated afterward (78.1 % and 81.2 % respectively). In conclusion, before the implementation of the program, the majority of nurses had subpar performance (knowledge and practice) with electrocardiography. Meanwhile, after the introduction of the program, most of the nurses in the study showed statistically significant improvement in their performance¹.

As of April 2018, Bazrafkan L and Hemmati M. According to the findings, the nurses in this study had extensive experience with and knowledge of ECGs. The nurses' familiarity with interpreting ECGs was heavily influenced by the hospital unit in which they worked and by the completion of prior ECG training courses. Accordingly, the nurses' ECG knowledge was significantly enhanced after attending training courses³.

A. Tahboub, O. Dal Yilmaz, U. Tahboub (2019) studied that the nurses demonstrated a high proficiency in using electrocardiograms (ECGs). An essential factor in the nurses' ECG interpretation experience was the hospital unit in which they worked and the number of ECG training courses they had completed. Because of this, ECG training courses significantly increased the nurses' ECG competence⁴.

Huitema, A.A., et al., January 2019. Improvements were seen in the diagnosis of both ST-elevation myocardial infarction (8.5%; 95% CI, 4.9-12.3%; $P 0.003$) and supraventricular tachycardia (39.0%; 95% CI, 17.2-60.8; $P 0.008$). These results persisted for a full three months (9.6%; 95% CI, 6.4-12.7; $P 0.0001$). No distinction was found between those with and without prior work experience or formal education. When it comes to enhancing EMS personnel's ECG diagnosis accuracy, exposure to ECGs is still crucial⁷.

Kim S, Kim CG. (2020). Demonstrated that after the training, there was no statistically significant difference between the teams and the lecture groups in terms of participants' knowledge of electrocardiography and their ability to read bedside (lead II rhythm) electrocardiography monitoring ($p > .05$). The ability to interpret 12-lead electrocardiograms did, however, differ significantly between the two groups ($p .001$). Improved nurses' ability to read 12-lead electrocardiograms was associated with a greater success rate of teaching-based learning⁹.

In July 2021, by Rahimpour M. The results of this study showed that emergency nurses had an ECG interpretation competency of (6.65 ± 2.16) on a 10-point scale, while EMS personnel only had a score of (4.87 ± 1.81) ($p < .05$). Compared to pre-hospital emergency medical personnel, emergency nurses in hospitals were better able to interpret ECGs ($p = .792$ and β (SE) = 0.22). (0.84). The ECG interpretation

competence of emergency nurses and EMS personnel needs to be developed and improved through active participation in the field and regular continued education¹⁵.

Mbatha, A.M.; Jivraj, N.; Meng'anyi, L.W. (2022). Overall, participants in this study had an 80.9 percent proficiency rate when it came to interpreting ECGs. 85.2% had a good understanding of how to interpret a normal ECG, while 72.1% knew how to do so for an abnormal one. People's familiarity with aberrant ECG interpretation was significantly related to their demographic information. There was a statistically significant relationship between respondents' ages and their years of experience ($p=0.004$ and 0.008 , respectively). This study's findings demonstrated that nurses have a "good" degree of understanding of ECG interpretation. Due to a lack of information, numerous aberrant ECG variables were incorrectly interpreted at rates below 70%, which is considered "unsatisfactory." To better equip nurses in CCUs to interpret ECGs, it is recommended that periodic scheduling of Continuous education programs (CPD) such as Advanced Cardiac Life Support courses (ACLS) be made²⁰.

A meta-analysis of 2 studies found that nurses have a high level of competence in ECG interpretation.

In the October 2018 Alanezi FZ. Most studies found that basic ECG training courses improved nurses' knowledge and that nurses who had received ECG training provided higher-quality care and better patient outcomes than those who had not. Furthermore, the training courses helped enhance the knowledge of cardiac care nurses regarding ECG interpretation, even though these nurses already possessed ECG interpretation skills due to their prior experience. The review also found that the incorporation of various instructional methods into ECG training programs (including online and simulation-based programs) led to improvements in care quality, nurse knowledge, and patient outcomes².

As per Ho JK (2021) significant correlations were found between the mean score and education/experience with ECGs, nursing, and emergency medicine. The emergency nurses' ability to interpret electrocardiograms was average. The training of emergency nurses needs to be improved¹².

Both Chen and Kunst (and others) are authors (2022). The majority of research has focused on nurses' ECG interpretation skills, and the author claims that here is where the term "competency" is most commonly used. It is possible that the wide variety of evaluation instruments utilized contributed to the large disparity in nurses' levels of expertise in this crucial nursing position. Several individual, professional, and organizational characteristics were shown to influence nurses' proficiency in ECG interpretation throughout the included studies. Based on their findings, the researchers concluded that nurses' levels of competence in interpreting electrocardiograms ranged from poor to high. A lack of frequent training and inadequate exposure to ECG interpretation was cited by nurses. Thus, it is suggested that regular, standard training and education be pursued. Furthermore, educators need a reliable method of assessing nurses' competence, and further study is required to build a standardized and complete ECG interpretation tool¹⁹.

McGrath A., Sampson M. (2022). These findings show that insufficient training may be to blame for a lack of trust in or familiarity with result interpretation. This article hopes that emergency nurses will be better equipped to recognize and respond to common cardiac rhythms on electrocardiograms (ECGs) seen in E.Ds. The article outlines a basic 5-step procedure for analysing the major aspects of heart rhythm²¹.

CONCLUSION

Thirteen of Twenty-one studies met the criteria for inclusion. The findings indicate that: Four studies have shown that nursing staff members have gaps in their understanding of ECG interpretation. More effort to increase knowledge and practice is not required if the current level of expertise is sufficient. 13 out of 7 studies found an increase in staff nurses' knowledge after education and training programs and found an association between nurses' knowledge and their actual practises, before the implementation of the program, the majority of nurses had subpar performance (knowledge and practice) with electrocardiography. Meanwhile, after the introduction of the program, most of the nurses in the study showed statistically significant improvement in their performance. The ability to interpret 12-lead electrocardiograms did, however, differ significantly between the two groups ($p .001$). Improved nurses' ability to read 12-lead electrocardiograms was associated with a greater success rate of teaching-based learning.

CONFLICT OF INTEREST

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REFERENCES

1. Nabil Malk R, Mostafa Rezk M, Said Mohammed S, Fouad Abd-Allah K. Effect of an Education Program on Nurses Performance Regarding Electrocardiography. *Egyptian Journal of Health Care*. 2018 Mar 1;9(1):38-49.
2. Alanezi FZ. A systematized review aimed to identify the impact of basic electrocardiogram training courses on qualified nurses. *Saudi Critical Care Journal*. 2018 Oct 1;2(4):51.
3. Bazrafkan L, Hemmati M. The effect of cardiac arrhythmias simulation software on the nurses' learning and professional development. 2018Apr;6(2):86.
4. Tahboub OY, Dal Yilmaz U. Nurses' knowledge and practices of electrocardiogram interpretation. *International Cardiovascular Research Journal*. 2019 Sep 30;13(3).
5. K N. Knowledge of Student Nurses Regarding Interpretation of Electrocardiogram: A Pre-Experimental Study. *NHIJ* [Internet]. 2019 [cited 2022 Jul 13];3(6). Available from: <https://medwinpublishers.com/NHIJ/NHIJ16000209.pdf>
6. Qaddumi J, Almahmoud O, Alamri M, Maniago J. Competency In Electrocardiogram Interpretation Among Registered Nurses In Private And Government Hospitals In Nablus, Palestine. *Majmaah J Heal Sci* [Internet]. 2019 [cited 2022 Jul 15];8(1):70. Available from: <https://www.ejmanager.com/fulltextpdf.php?mno=28512>
7. Huitema AA, Alemayehu M, Steiner OL, Bagur R, Lavi S. Improving Electrocardiography Diagnostic Accuracy in Emergency Medical Services Personnel. *ICJC open*. 2019 Jan 1;1(1):28-34.
8. Mobrad A. Electrocardiogram Interpretation Competency Among Paramedic Students. *JMDH* [Internet]. 2020 Aug [cited 2022 Jul 15]; Volume 13:823-8. Available from: <https://www.dovepress.com/electrocardiogram-interpretation-competency-among-paramedic-students-peer-reviewed-article-JMDH>.
9. Kim S, Kim CG. Effects of an electrocardiography training program: Team-based learning for early-stage intensive care unit nurses. *The Journal of Continuing Education in Nursing*. 2020 Apr 1;51(4):174-80.
10. Al-Ahdal SA, Makki FO. Nurses' Performance Regarding Emergency Management of Arrhythmias Post-Cardiac Surgery at Cardiac Centers, Khartoum, Sudan. *Journal of Complementary Medicine Research*. 2020 Jul 17;11(1):221.
11. Somani S, Russak AJ, Richter F, Zhao S, Vaid A, Chaudhry F, et al. Deep learning and the electrocardiogram: review of the current state-of-the-art. *EP Europace* [Internet]. 2021 Aug 6 [cited 2022 Jul 15];23(8):1179-91. Available from: <https://academic.oup.com/europace/article/23/8/1179/6132071>.
12. Ho JK, Yau CH, Wong CY, Tsui JS. Capability of emergency nurses for electrocardiogram interpretation. *International Emergency Nursing*. 2021 Jan 1;54:100953.
13. Ng LK. Improving an Electrocardiogram Competency Assessment Tool for Registered Nurses.
14. Radha K, Alex M, Agnihoj P, Patidar AB. Effectiveness of Virtual Teaching on Knowledge Regarding Electrocardiogram Interpretation Among Undergraduate Nursing Students. *Nursing Journal of India*. 2021 Nov 1;112(6):243-7.
15. Rahimpour M, Shahbazi S, Ghafourifard M, Gilani N, Breen C. Electrocardiogram interpretation competency among emergency nurses and emergency medical service (EMS) personnel: A cross-sectional and comparative descriptive study. *Nursing Open*. 2021 Jul;8(4):1712-9.
16. Nishiguchi S, Sugaya N, Saigusa Y, Mayama M, Moromizato T, Inamori M, et al. Effects of Electrocardiographic Monitoring Education on Nurses' Confidence and Psychological Stress: An Online Cross-Sectional Survey in Japan. *IJERPH* [Internet]. 2022 Apr 14 [cited 2022 Jul 15];19(8):4742. Available from: <https://www.mdpi.com/1660-4601/19/8/4742>.
17. Calixte D, Haynes NA, Robert M, Edmond C, Yan LD, Raiti-Palazzolo K, et al. Online team-based electrocardiogram training in Haiti: evidence from the field. *BMC Med Educ* [Internet]. 2022 Dec [cited 2022 Jul 15];22(1):360. Available from: <https://bmcmmeduc.biomedcentral.com/articles/10.1186/s12909-022-03421-8>.
18. Amini K, Mirzaei A, Hosseini M, Zandian H, Azizpour I, Haghi Y. Assessment of electrocardiogram interpretation competency among healthcare professionals and students of Ardabil University of Medical Sciences: a multidisciplinary study. *BMC Med Educ* [Internet]. 2022 Dec [cited 2022 Jul 15];22(1):448. Available from: <https://bmcmmeduc.biomedcentral.com/articles/10.1186/s12909-022-03518-0>.
19. Chen Y, Kunst E, Nasrawi D, Massey D, Johnston AN, Keller K, Fengzhi Lin F. Nurses' competency in electrocardiogram interpretation in acute care settings: A systematic review. *Journal of advanced nursing*. 2022 May;78(5):1245-66.
20. Mbatha AM, Jivraj N, Meng'anyi LW. Knowledge Level Of Nurses On Interpretation Of Normal And Abnormal Electrocardiogram In Critical Care Units Of A Level 6 Hospital In Kenya. *Kenyan Journal of Nursing & Midwifery*. 2022 Jun 17;7(1):115-28.
21. McGrath A, Sampson M. Electrocardiograms: a guide to rhythm recognition for emergency nurses. *Emergency Nurse*. 2022 May 3;30(3).

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