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Effectiveness of Capacity Building Programme on Competency of Electrocardiogram (ECG) Interpretation Among Critical Care Nurses

Balasivanandan S[1], Manjula Annamalai[2*], Porkodi Arjunan[2], Kavitha C[3] and Kavitha Ramanathan[4]

[1]Sri Ramachandra Faculty of Nursing, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, India; [2]Department of Medical Surgical Nursing, Sri Ramachandra Faculty of Nursing, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, India; [3]Department of Critical Care, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, India; [4]Nursing Department, College of Nursing, CON-A, King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), King Abdullah International Medical Research Center (KAIMRC), Ministry of the National Guard - Health Affairs, Al Ahsa, Saudi Arabia

E-mail/Orcid Id:

BS, balasivanandan@gmail.com, https://orcid.org/0009-0005-6625-5182; *MA,* manjula.a@sriramachandra.edu.in, https://orcid.org/0000-0002-7820-1801; *PA,* porkodi@sriramachandra.edu.in, https://orcid.org/0000-0003-0589-8000; *KC,* kavithachendhilkumar@gmail.com, https://orcid.org/0000-0003-4996-6781; *KR,* ramanathank@ksau-hs.edu.sa, https://orcid.org/0000-0002-5437-605X

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Abstract: This study investigates the effects of a capacity-building programme on the competency of ECG interpretation among critical care nurses. Electrocardiogram (ECG) interpretation is a fundamental clinical skill essential for the rapid diagnosis of potentially life-threatening conditions. Misinterpretation of ECGs can result in inappropriate clinical decisions, leading to adverse patient outcomes. This study, conducted at a tertiary care hospital with over 1600 beds and six fully equipped intensive care units, aimed to improve the knowledge and practice of ECG interpretation among nurses frequently recording ECGs. A quantitative quasi-experimental study was conducted with 100 nurses selected using non-probability purposive sampling. Pre-test and post-test assessments were used to evaluate knowledge and practice, and data were analyzed using descriptive and inferential statistics. The results showed that the study group had significantly higher post-test knowledge and practice scores compared to the control group, with a strong positive correlation between knowledge and practice scores. The findings highlight the importance of continuous education and training for healthcare professionals.

Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally, taking an estimated 17.9 million lives each year (World Health Organization, 2022). Augustus Waller published the first human electrocardiogram (ECG) in 1887 (Xiang-Lin et al., 2015). CVD can result in electrocardiogram (ECG)-detectable dysrhythmias, making ECG the primary diagnostic tool for assessing individuals with chest pain (Atwood et al., 2015; Madhual et al., 2023). According to the American College of Cardiology and American Heart Association, an ECG should be collected and analyzed within 10 minutes of arrival in patients with evident acute coronary syndrome symptoms. Delayed and inaccurate interpretation of dysrhythmias has been shown to compromise patient outcomes (Alghamdi et al., 2022; Atwood and Wadlund, 2015).

Nurses play a critical role in identifying ECG abnormalities and ensuring that patients receive prompt and effective care. The ECG is crucial for diagnosing chest pain and providing valuable information for assessing the risks and symptoms of acute coronary syndromes and cardiac arrhythmias (AlGhatrif and Lindsay, 2012). Nurses are typically the initial healthcare

***Corresponding Author:** manjula.a@sriramachandra.edu.in

providers to respond to cardiac arrests within hospitals, necessitating fundamental resuscitation skills and the ability to identify basic ECG rhythms. They are responsible for monitoring and making clinical decisions based on the data obtained from the monitor (Atwood and Wadlund, 2015).

According to a study (Dogan, 2012), 60.5% of nurses reported lacking knowledge in electrocardiography monitoring and recognizing different types of arrhythmias. Another study conducted in Baghdad focused on early intervention for patients with ventricular tachycardia, revealing that nurses had insufficient knowledge in this area (Ahmed et al., 2014; Mousa et al., 2016). Incorrect interpretations of ECG can lead to increased healthcare costs and delays in the admission process, posing a burden for both patients and healthcare providers (Fadlalmola et al., 2023; Tahboubet al., 2019; Drew and Funk, 2006). Recent studies have explored and compared various instructional methods, encompassing self-directed learning (like online courses or modules), lecture-based or workshop-based formats, simulation-based and peer training within small group settings (Kes, 2023; Nakamura, 2021; Kashou, 2020; Ribeiro, 2020; Khalil et al., 2023).

The PULSE trial is an online programme for ECG monitoring education that enhances nurses' knowledge about ECG monitoring, improves the quality of care associated with ECG monitoring, and positively impacts patient outcomes (Ng and Christensen, 2023; Funk et al., 2017; Hawe et al., 1997). A capacity-building programme refers to a series of training and workshop activities aimed at helping Member States enhance their ability to implement national digital health strategies and plans. This includes developing the capacity to evaluate the impact of such strategies and improving digital literacy to create relevant curricula and deliver training programmes on various digital health topics (World Health Organization, 2022). Enhancing nurses' knowledge and practice through targeted training is essential for the early identification and treatment of heart disorders (Chen, 2022; Sarrafzadegan and Mohammadifard, 2019). Given their frontline role, nurses must be proficient in ECG interpretation to make quick decisions and initiate appropriate interventions (Zhang, 2013; AlGhatrif and Lindsay, 2012). This study aims to assess and improve the competency of critical care nurses in ECG interpretation through a capacity-building programme, addressing gaps in knowledge and practice to enhance patient care and outcomes. Competency is defined as an integration of skills, knowledge, attitude, values, and abilities that lead to effective or high performance in professional situations (Levett Jones, 2011)

Materials and methods

A quasi-experimental study design was employed to assess the competency of ECG interpretation among critical care nurses using knowledge and practice questionnaires. ECG competency was evaluated both between and within the study and control groups before and after the capacity-building programme. The study was conducted in Chennai, India, and received approval from the Institute of Ethics Committee (CSP/22/AUG/115/468). The study was conducted over the period of 2022-2023. A total of 100 critical care nurses who expressed interest and met the inclusion criteria were selected using non-probability purposive sampling. A capacity-building programme on ECG interpretation was conducted for the study group participants following the pre-test. The programme consisted of five sessions over five consecutive days:

- **Day 1**: Video presentation (10-20 minutes)
- **Day 2**: Group discussion (10-20 minutes)
- **Day 3**: Case study (10-20 minutes)
- **Day 4**: Brainstorming (10-20 minutes)
- **Day 5**: Reinforcement (10-20 minutes)

The video presentation was shared via WhatsApp for daily review by the study group participants. The same content was shared with to control group at the end of the study. The study and control group participants were taken from different critical care units and had no chance of contamination.

Data Collection

Participants completed pre-intervention questionnaires covering background variables (age, gender, years of experience, previous ECG training) and study outcomes using knowledge and practice questionnaires. Knowledge was assessed through multiple-choice questions, and practice was assessed by interpreting an ECG image, with evaluations conducted using a checklist within 15 minutes.

The capacity-building programme sessions were held in ICU classrooms with 10 nurses per session, conducted at the end of morning and night shifts. The first day involved a 10-minute video presentation created by the researcher. Subsequent days included group discussions, case studies on arrhythmias, brainstorming sessions, and reinforcement activities. Post-test knowledge and practice questionnaires were administered to nurses in groups under the supervision of the researcher for 15-20 minutes on the 15th day.

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Instruments

The data collection instrument consisted of three sections:

1. Background variables (10 items)
2. Knowledge questions (20 items)
3. Practice questions (15 items)

Each correct answer was awarded one mark. Knowledge scores were interpreted as follows:

- Inadequate knowledge: <10 (50%)
- Moderate knowledge: 11-15
- Adequate knowledge: 16-20

Practice scores were interpreted as:

- Unsatisfactory: <8
- Satisfactory: 9-11
- Excellent: 12-15

The reliability of the knowledge questionnaire was 0.83, and the practice questionnaire was 0.86.

Sample Size

The sample size was calculated based on a previous study on ECG interpretation using the CRISP method (Denise Atwood & Diana, 2015):

$$n = \frac{[DEFF \times Np(1-p)]}{[(d^2/Z^2_{1-\alpha/2} \times (N-1)) + p(1-p)]} = 85$$

Considering a 10% attrition rate, the total sample size was determined to be 100.

Result and discussion

The demographic distribution of participants showed similarities across age, gender, years of experience, and educational background between the study and control groups.

Knowledge and Practice Assessment

Pre-test knowledge in the study group showed 76% had inadequate knowledge, 24% had moderate knowledge and none had adequate knowledge, which indicates a low ECG interpretation competency (Table 1). Consistent with these findings, Getachew's study also showed low ECG interpretation competency in medical interns (Fadlalmola et al., 2023; Getachew, 2020; Chamiso, 2024; Santana-Santos, 2017). Post-intervention results improved significantly, with only 6% having inadequate knowledge and 52% demonstrating moderate knowledge. The control group showed no significant change in Practice scores, while the study group improved post-intervention, with unsatisfactory practice decreasing from 68% to 8%, satisfactory practice increasing from 30% to 66%, and excellent practice increasing from 2% to 26%. The control group showed minimal changes. These findings align with the study by (Ng and Christensen, 2023; Zakynthinos et al., 2023), which also indicated that educational interventions improve ECG interpretation skills among nurses.

The study group's post-test mean knowledge scores were significantly higher across all categories compared to the control group. The mean overall score for the study group was 14.18, significantly higher than the control group's 8.00 ($p<0.001$) (Table 2).

Table 1. Frequency and percentage distribution of knowledge and practice on ECG Interpretation among critical care nurses in the study group and the control group (N=100).

	Study group				Control group			
	Pretest		Post-test		Pretest		Post-test	
	n	%	n	%	n	%	N	%
Knowledge (20 items)								
Inadequate	38	76	3	6	40	80	28	56
Moderately adequate	12	24	26	52	10	20	22	44
Adequate	0	0	21	42	0	0	0	0
Practice (15 items)								
Unsatisfactory	34	68	4	8	26	52	24	48
Satisfactory	15	30	33	66	21	42	24	48
Excellent	1	2	13	26	3	6	2	4

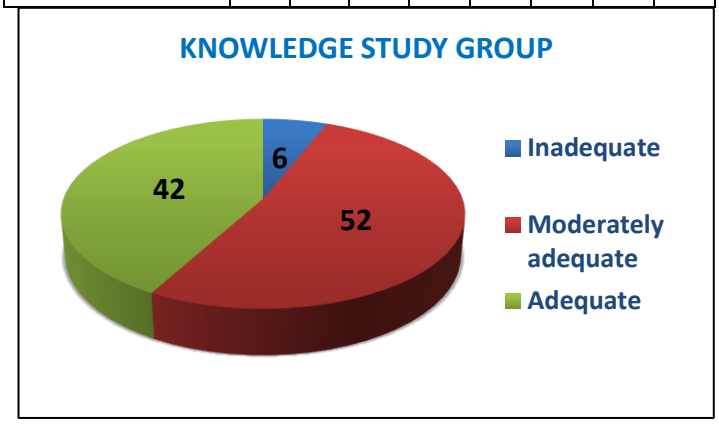

Figure 1. Percentage distribution of knowledge on ECG Interpretation among critical care nurses in the study group (N=100).

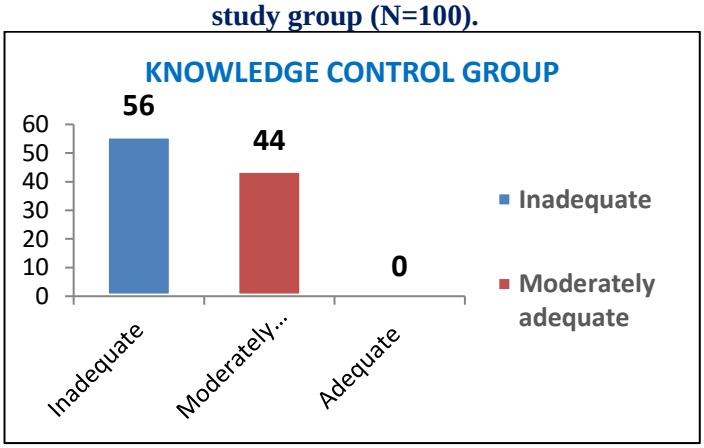

Figure 2. Percentage distribution of knowledge on ECG Interpretation among critical care nurses in the control group (N=100).

Figure 3. Percentage distribution of practice on ECG Interpretation among critical care nurses in the study group and the control group (N=100).

Table 2. Comparison of mean & standard deviation of Pre and Post-test knowledge scores on ECG Interpretation among critical care nurses within study and control groups (N=100).

	Study Group(n=50)				Control Group(n=50)			
	Pretest	Post-test	Paired t test		Pretest	Post-test	Paired t test	
Knowledge	Mean (SD)	Mean (SD)	Mean Difference (95%CI)	t-value df p-value	Mean (SD)	Mean (SD)	Mean Difference (95%CI)	t-value df p-value
Basics of ECG	1.80 (1.03)	3.82 (1.30)	2.02 (1.54, 2.5)	8.481 49 p=0.000***	1.71 (1.14)	2.44 (0.99)	0.72 (0.35,1.0)	3.982 49 p=0.001***
Conduction system	2.08 (1.24)	3.32 (1.10)	1.24 (0.78, 1.7)	5.401 49 P=0.000***	2.04 (1.08)	2.4 (1.08)	0.36 (0.04,0.6)	2.272 49 p=0.028*
ECG interpretation	1.88 (1.27)	2.92 (1.12)	1.04 (0.61, 1.4)	4.823 49 p=0.000***	1.5 (1.13)	2.0 (1.18)	0.50 (0.12,0.8)	2.631 49 p=0.01**
Steps of ECG interpretation	1.1 (0.78)	4.12 (1.30)	3.02 (2.62, 3.4)	15.338 49 p=0.000***	1.38 (0.86)	1.16 (0.71)	0.22 (-0.53,0.09)	1.448 49 p=0.15(NS)
Overall	6.86 (2.71)	14.18 (3.23)	7.32 (6.12, 8.5)	12.33 49 p=0.000***	6.64 (2.66)	8 (2.52)	1.36 (0.63,2.0)	3.743 49 p=0.00***

Post-test practice scores in the study group were significantly higher in basic ECG interpretation, sinus rhythms, atrial arrhythmias, and ventricular arrhythmias compared to the control group. The overall mean practice score was significantly higher in the study group (7.32) compared to the control group (6.88) ($p<0.05$) (Table 3). These findings are supported by (Breen, 2022), who

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Table 3. Comparison of mean & standard deviation of Pre and Post-test practice scores on ECG Interpretation among critical care nurses in the study group and the control group (N=100).

	Study Group(n=50)				Control group (n=50)			
	Pretest	Post-test	Paired t test		Pretest	Post-test	Paired t test	
Practice	Mean (SD)	Mean (SD)	Mean Difference (95%CI)	t-value df p-value	Mean (SD)	Mean (SD)	Mean Difference (95%CI)	t-value df p-value
Basic ECG interpretation	2.26 (1.19)	4.22 (1.11)	1.96 (1.48,2.44)	8.202 49 p=0.000***	2.96 (1.09)	3.20 (0.93)	0.24 (-0.03,0.52)	1.731 49 p=0.09 (NS)
Sinus rhythms	0.88 (0.69)	1.76 (0.59)	0.88 (0.60,1.16)	6.335 49 p=0.000***	1.10 (0.71)	1.3 (0.74)	0.20 (-0.06,0.46)	1.528 49 p=0.133(NS)
Atrial arrhythmias	1.32 (0.91)	2.04 (1.01)	0.72 (0.39,1.05)	4.319 49 p=0.000***	1.16 (0.99)	0.98 (0.94)	0.18 (-0.48,0.12)	1.197 49 p=0.237(NS)
Ventricular arrhythmias	0.56 (0.64)	1.54 (0.73)	0.98 (0.71,1.25)	7.23 49 p=0.000***	0.72 (0.86)	0.84 (0.84)	0.12 (-0.21,0.45)	0.724 49 p=0.472(NS)
Heart blocks	0.80 (0.73)	1.06 (0.87)	0.26 (0.03,0.55)	1.791 49 p=0.079(NS)	0.80 (0.88)	0.74 (0.75)	0.06 (-0.37,0.25)	0.387 49 p=0.70 (NS)
Overall	5.82 (2.49)	10.62 (2.66)	4.8 (-5.85,3.74)	9.125 49 p=0.000***	6.74 (3.15)	7.06 (2.60)	0.32 (-0.37,1.01)	0.938 49 p=0.353(NS)
P< 0.001 significant, NS: Non-significant								

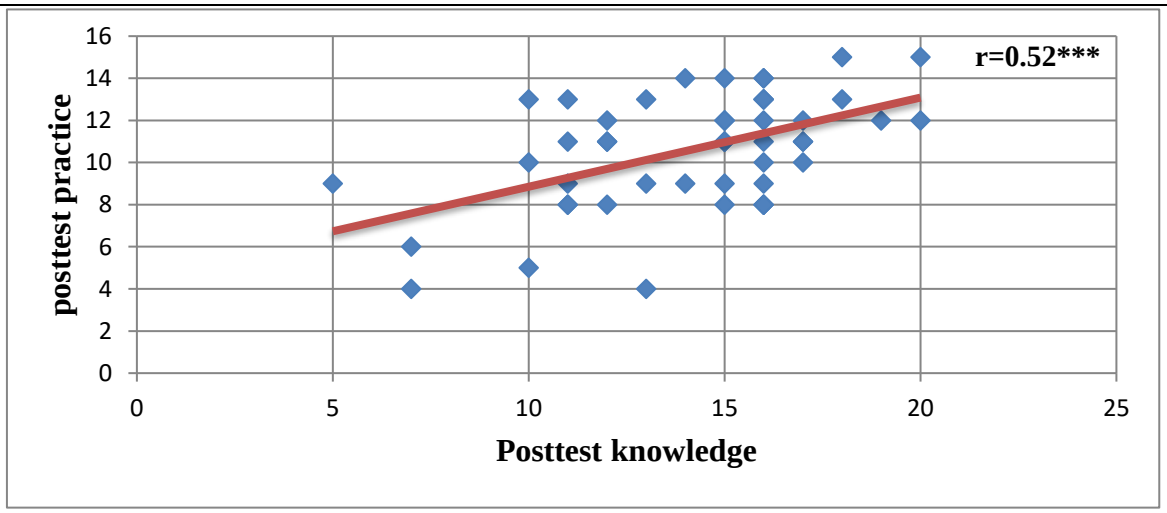

Figure 4. Correlation of knowledge and practice on ECG Interpretation among critical care nurses in the study group (n=50).

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demonstrated that educational interventions significantly improve ECG interpretation skills.

Correlation of Knowledge and Practice

A strong positive correlation was found between knowledge and practice in both the study ($r=0.52$, $p<0.001$***) and control groups ($r=0.60$, $p<0.001$***), indicating that increased knowledge correlates with improved practice. Amini et al. (2022) similarly found a strong positive correlation ($r=0.72$) between knowledge and practice, reinforcing the importance of training programs (Figure 1).

No significant association was found between knowledge scores and demographic variables such as age, gender, years of experience, and education level, except for previous ECG interpretation programs. Receiving recurrent training annually, accompanied by guidance from an ECG specialist, could be a viable approach to attaining the required level of training essential for enhancing competency in ECG interpretation (Werner et al., 2016). There was no relationship between ECG interpretation competency and work experience in the findings of the study by (Rahimpour et al., 2021). These findings align with (Amini et al., 2017), who identified previous ECG interpretation programs as a significant predictor of knowledge.

Conclusion

The capacity-building program substantially enhanced ECG interpretation competency among critical care nurses, demonstrating a clear and positive correlation between increased knowledge and improved clinical practice. These findings highlight the critical importance of ongoing educational initiatives to continually advance clinical skills. Furthermore, the results align with Malcolm Knowles' Adult Learning Theory, which underscores the value of self-directed learning and the practical relevance of educational content in motivating adult learners and improving their competencies. This reinforces the need for tailored, continuous education strategies to sustain and elevate clinical proficiency.

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Conflict of Interest

The authors declare no conflict of interest.

Consent

Written consent was obtained from all the participants.

References

Ahmed, A. A. (2014). Assessment of nurses' knowledge regarding ECG changes in myocardial infarction in three selected hospitals in Baghdad. *Journal of Education and Practice*,*5*(9), 70-78.

Alghamdi, S. M., Almutairi, B. F., Al-Surimi, K. M., &Alaklabi, A. (2018). Electrocardiography knowledge and skills among healthcare professionals in Saudi Arabia. *Journal of Family Medicine and Primary Care*, *7*(6), 1313-1320.

Amini, K., Mirzaei, A., Hosseini, M., Zandian, H., Azizpour, I., & Haghi, Y. (2022). Assessment of electrocardiogram interpretation competency among healthcare professionals and students of Ardabil University of Medical Sciences: a multidisciplinary study. *BMC Medical Education*, *22*(1), 448. https://doi.org/10.1186/s12909-022-03518-0

Atwood, D., & Wadlund, D. L. (2015). ECG interpretation using the CRISP method: a guide for nurses. *AORN Journal*, *102*(4), 396-408. https://doi.org/10.1016/j.aorn.2015.08.004

Breen, C. J., Kelly, G. P., &Kernohan, W. G. (2022). ECG interpretation skill acquisition: A review of learning, teaching and assessment. *Journal of Electrocardiology*, *73*, 125-128. https://doi.org/10.1016/j.jelectrocard.2019.03.010

Chamiso, T.M., Lemessa Jinfessa, F., & Jibril, M. (2024). Knowledge, practice, and factors associated with electrocardiography interpretation among nurses working in adult emergency and critical care units at selected governmental hospitals in Addis Ababa, Ethiopia, 2023: a cross-sectional study. *BMC Nurs.*, *23*, 557. https://doi.org/10.1186/s12912-024-02201-7

Chen, Y., Kunst, E., Nasrawi, D., Massey, D., Johnston, A. N., Keller, K., &Fengzhi Lin, F. (2022). Nurses' competency in electrocardiogram interpretation in acute care settings: A systematic review. *Journal of Advanced Nursing*, *78*(5), 1245-1266. https://doi.org/10.1111/jan.15147

Doğan, H. D. (2012). Cardiac arrhythmia knowledge levels of nurses working in intensive care units. *Journal of Nursing Scholarship*, *44*(4), 339-346.

Drew, B. J., & Funk, M. (2006). Improving ECG monitoring: An important patient safety activity. *Journal of Electrocardiology*, *39*(4 Suppl), S1-S5.

Getachew, M., Beyene, T., & Kebede, S. (2020). Electrocardiography interpretation competency of medical interns: experience from two Ethiopian medical schools. *Emergency Medicine International*, *2020*, Article ID: 769563. https://doi.org/10.1155/2020/7695638

Fadlalmola, H., Tubaishat, A., & Habiballa, M. (2023). The Impact of Training Program on Nurse's Knowledge and Skills of Myocardial Infarction Screening by Using Electrocardiogram. *Critical Care Nursing Quarterly*, *46*(2), 165-175. https://doi.org/10.1097/CNQ.0000000000000449

Funk, M., Fennie, K. P., Stephens, K. E., May, J. L., Winkler, C. G., & Drew, B. J. (2017). Association of implementation of practice standards for electrocardiographic monitoring with nurses' knowledge, quality of care, and patient outcomes: findings from the Practical Use of the Latest Standards of Electrocardiography (PULSE) Trial. *Circulation: Cardiovascular Quality and Outcomes*, *10*(2), e003132. https://doi.org/10.1161/CIRCOUTCOMES.116.003132

Hawe, P., Noort, M., King, L., & Jordens, C. (1997). Multiplying health gains: the critical role of capacity-building within health promotion programs. *Health Policy*, *39*(1), 29-42. https://doi.org/10.1016/s0168-8510(96)00847-0.

Kashou, A., May, A., DeSimone, C., &Noseworthy, P. (2020). The essential skill of ECG interpretation: How do we define and improve competency? *Postgraduate Medical Journal*, *96*(1133), 125-127. https://doi.org/10.1136/postgradmedj-2019-137191

Kes, D., Ozduran, B., Celik, S., & Cetin, E. (2023). The effectiveness of short text messages on nurses' arrhythmia interpretation skills. *Nursing in Critical Care*, *28*(3), 362-369. https://doi.org/10.1111/nicc.12712

Khalil, A.I., Hantira, N.Y., & Alnajjar, H.A. (2023). The Effect of Simulation Training on Enhancing Nursing Students' Perceptions to Incorporate Patients' Families Into Treatment Plans: A Randomized Experimental Study. *Cureus*, *15*(8), e44152. https://doi.org/10.7759/cureus.44152.

Levett-Jones, T., Gersbach, J., Arthur, C., & Roche, J. (2011). Implementing a clinical competency assessment model that promotes critical reflection and ensures nursing graduates' readiness for professional practice. *Nurse Education in Practice*, *11*(1), 64-69.

Madhual, S., Nayak, D., Dalei, S., Padhi, T., & Das, N. R. (2023). Assessment of cardiovascular risk factors in male androgenetic alopecia: A case control study in a tertiary care hospital of western Odisha. *Int. J. Exp. Res. Rev.*, *36*, 425-432. https://doi.org/10.52756/ijerr.2023.v36.037

Mousa, A. M., Owaid, H. A., Ahmed, R. S., Zedaan, H. A., &Shalal, S. H. (2016). Nurses' knowledge concerning early interventions for patients with ventricular tachycardia at Baghdad teaching hospitals. *kufa Journal for Nursing Sciences*, *6*(2), 8-15. https://doi.org/10.36321/kjns.vi20162.2705

Nakamura, S., et al. (2021). Effectiveness of short training programme for improving electrocardiogram interpretation skills among emergency nurses: A single-group before-after study. *Journal of Emergency Nursing*, *47*(5), 630-635.

Ng, J., & Christensen, M. (2023). Registered nurses' knowledge and interpretation of ECG rhythms: A cross-sectional study. *Nursing in Critical Care*. https://doi.org/10.1111/nicc.13013

Rahimpour, M., Shahbazi, S., Ghafourifard, M., Gilani, N., & Breen, C. (2021). Electrocardiogram interpretation competency among emergency nurses and emergency medical service (EMS) personnel: A cross-sectional and comparative descriptive study. *Nursing Open*, *8*(4), 1712-1719. https://doi.org/10.1002/nop2.809

Ribeiro, A. H., Ribeiro, M. H., Paixão, G. M., Oliveira, D. M., Gomes, P. R., Canazart, J. A., & Ribeiro, A. L. P. (2020). Automatic diagnosis of the 12-lead ECG using a deep neural network. *Nature Communications*, *11*(1), 1760. https://doi.org/10.1038/s41467-020-15432-4

Sarrafzadegan, N., &Mohammadifard, N. (2019). Role of nursing education in controlling cardiovascular disease. *ARYA Atherosclerosis*, *15*(6), 304–312.

Santana-Santos, E., Pires, E., Silva, J., Sallai, V., Bezerra, D., & Ferretti-Rebustini, R. E. D. L. (2017). Ability of nurses interpret a 12-lead electrocardiography. *RevistaBaiana De Enfermagem*, *31*(1), 1-8.

Tahboub, O. Y., & Dal Yilmaz, U. (2019). Nurses' knowledge and practices of electrocardiogram interpretation. *International cardiovascular research journal*, *13*(3).

WHO (World Health Organization). (2022). Cardiovascular Diseases (CVDs) Fact Sheet. Retrieved from https://www.who.int/news-

room/fact-sheets/detail/cardiovascular-diseases-(cvds)

Werner, K., Kander, K., & Axelsson, C. (2016). Electrocardiogram interpretation skills among ambulance nurses. *European Journal of Cardiovascular Nursing*, *15*(4), 262-268.

Xiang-Lin Yang, X., Papazoglou, A., Hu, G., Kondakci, G., Makris, G., &Xiong, W. (2015). A brief review on the history of human electroencephalography research. *Neurology Research International*, *2015*, 814216.

Zhang, Z., & Hsu, H. H. (2013). Evaluating healthcare professionals' ECG interpretation skills: systematic review. *BioMed Research International*, *2013*, 452591.

Zakynthinos, G. E., Tsolaki, V., Oikonomou, E., Vavouranakis, M., Siasos, G., &Zakynthinos, (2023). Metabolic Syndrome and Atrial Fibrillation: Different Entities or Combined Disorders. *Journal of Personalized Medicine*, *13*(9), 1323. https://doi.org/10.3390/jpm13091323

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