Acquisition and Retention of Ecg Interpretation Skill Among Baccalaureate Nursing Students

Ms. Jyoti[1]*, Dr Jyoti Sarin[2]
[1]PhD Scholar, MMDU Mulana HaryanaPrincipal
Government Medical College & Hospital, College of Nursing.
Chandigarh India
[2]Director, College of Nursing MMDU Mulana, Haryana,
*Corresponding author's
Email: jyotikathwal@gmail.com)

Abstract
The literature reveals that ECG a vital diagnostic tool, offers inseparable information regarding the diagnosis, prediction of risk and prognosis. Nurses when equipped with knowledge to interpret ECG can aid into saving lives and prevent unwanted complications. Moreover, a virtual learning program which can cater the learning needs, providing the freedom of self-paced learning, plays significant role in improving the clinical judgement. Therefore, study aimed to assess the efficacy of virtual learning program in terms of acquisition and retention of ECG interpretation skill. Materials & Methods-Intervention (VLP) & Tools were developed and validated by the experts, tool included demographic profile, knowledge test. Method of data collection was self-reporting, study participants were given access to the virtual learning program (VLP) on first day and their demographic profile and pre test was administered from day two to day six, study participants learnt from the VLP on ECG interpretation and on seventh day post test was administered followed by time series post tests on 14th as well as 30th day. Results show that knowledge improved significantly (p value 2.694) on comparison with Tukey's method, it was found that the knowledge increased in 1st post test and the trend of knowledge retention revealed that it increased in the first post test further increased with second posttest and decreased (yet higher than first posttest) scores. Comparison of the groups revealed that there was significant change in the knowledge skill with significant t value18.516 at 0.05 level. Thus, conclusion was drawn that the learning with VLP helped the students to gain knowledge and retain it for longer,

Keywords: Education, Nursing, ECG interpretation, Skill, Virtual learning program

1. Introduction

Diseases of heart and blood vessels are categorized as CVD, are responsible for 17.3 million per year which makes it world's leading cause of death. India too falls in the stream with CVD being the leading cause of mortality for the nation.[1,2] Indians have been affected by CVD, a decade earlier and during their most productive life that is midlife [3,4] before age of 70 years , world have 23percent CVD death rate whereas Indians rate is recorded to be 52 percent[5]

CVD claiming more deaths in lower income countries including India as compared to middle, higher income group countries [6,7]. According to the WHO report estimating the CVD burden, India lost $237 billion on health care over last ten years (2005-2015).[8]

India has vast heterogeneity in population in terms of risk factors prevalence and with rise of Non-Communicable Diseases (NCD) rapidly in last two decades, nearly two third of the NCD mortality credits to the CVD related conditions. [9-11]

Literature evidently speaks about bedside cardiology deterioration and replaced by recent advancements and technology. Diagnosis could be done with history, physical examination and further supplemented by investigation like ECG. Apparently, the technological advancements have brought crisper definition of both anatomical & physiological abnormalities. Newer technologies like nuclear medicine, ultrasonography, computed tomography, and magnetic resonance imaging holter monitoring, telemetry, bedside monitoring have empowered the clinical capabilities of health care team members.[12] ECG is an inseparable tool in cardiac nursing and brings power of diagnosis and early identification as well as prediction of prognosis. [13]

Among nurses' basic knowledge related to recording and interpretation was found to be insufficient as reported by 40 nurses who were assessed with 14 item questionnaire on 12 lead ECG knowledge, results revealed that apart from lack of knowledge, need for inservice education was utmost need and desired by the nurses.[14]

Like wise results were found among critical care nurses' perception of arrhythmia knowledge on ECG interpretation. It was found that a deficit in nurses' ability to recognize and identify specific arrhythmias including heart block, aberrant conduction, and tachy arrhythmias. Understanding of lead placement concepts varied greatly among participants. [15]

Good management of diseases is dictated by the knowledge of nurses related to ECG recording and interpretation. With technology being an aid to ECG

Doi.org/10.31838/hiv22.02.797 Received: 22.07.22, Revised: 13.08.22, Accepted: 11.09.22

interpretation nurses have responsibility for understanding the changes in ECG and patient condition's and respond accordingly, appropriately. Nurse's knowledge helps in recognizing and managing the contingencies effectively and timely.[16]

Hence, nursing curriculum implementation need to improve on the knowledge gain, its retention, as well as the clinical judgement ability. Previous studies have explored and identified some of the main characteristics of nurses' professional practice, clinical judgment, and clinical decision-making. [17,18] These characteristics included using knowledge and conceptual models in practice [19] adopting an interdisciplinary collaborative decision-making approach[20], including clinical judgment in nursing educational programs[21], and using evidence, intuition and autonomy[21-23]. Implementing educational programs for improving nurses' clinical judgment is another characteristic of professional nursing practice. Kantar and Alexander[24] integrated clinical judgment into nursing curriculum and reported that education enhances nurses' clinical judgment skills [25]. Other educational interventions such as conceptualizing [26] and simulation [27] as well as teaching critical thinking skills [28] can also improve nurses' clinical judgment ability. Moreover, student nurses are bound to be knowledgeable about 12 lead ECG and disseminate the same with the nurses who care for cardiac clients especially acute coronary syndrome. [28]

Virtual learning is defined as the delivery of learning through electronic mediation which bridges the gap caused when the instructor and student are separated in either time or place Traditional methods of teaching have always been focused on group and teacher centered and limited to a classroom, whereas the virtual learning has no limitation of space, time and solely student centred.[29]

The literature revealed that ECG a vital diagnostic tool, offers inseparable information regarding the diagnosis, prediction of risk and prognosis. Nurses when equipped with knowledge to interpret ECG can aid into saving lives and prevent unwanted complications. Moreover, a virtual learning program which can cater the learning needs, providing the freedom of self-paced learning, plays significant role in improving the clinical judgement. Therefore, investigator intents to examine the effect of virtual learning program in terms of acquisition and retention of ECG interpretation skill.

Objectives of the study were to

1. Develop and validate the virtual learning program on ECG interpretation skill
2. Assess and compare acquisition and retention of ECG interpretation skill before and after the virtual learning program among baccalaureate nursing students
3. Determine association of acquisition and retention of ECG interpretation skill with selected variables among baccalaureate nursing students.

2. Material and methods

Virtual learning program was developed and validated from Medical and nursing experts. Tools for knowledge acquisition were also developed based on available literature and expert's guidance and were validated as well. Reliability was assessed statistically, and tools were found to be reliable. Difficulty index and discrimination index were also statistically calculated for each item of the tools which were found to be moderate. Study was conducted on baccalaureate second year nursing students; baseline data was collected with help pretest and two different nursing institutes were selected in urban area. User name and passwords were initially given by the investigator for first login which were later changed by the user as per their preference. After this investigator had no control over access and the progress of the study participants. Participants were provided five days for learning ECG through virtual learning program. Thereafter, time series data was collected at interval of 7 days, 15 days and 30 days.

Data was analyzed according to the objectives of the study using descriptive and inferential statistics and is presented in the form of tables, graphs, and diagram.

3. Results

Table-1. Frequency Distribution of Socio Demographic Profile N=70

		EXP fr (%)	MEAN	SD±	CONTROL fr (%)	MEAN	SD±
Age in Years	i) 19 years	13(37.1%)	6.85	3.98	12 (34.3%)	6.33	2.96
	ii)20 years	14(40.0%)	5.86	4.45	0 (0.0%)		
	iii)21 years	5 (14.3%)	7.40	5.03	21 (60.0%)	4.24	2.96
	iv)22 years and above	3 (8.6%)	6.33	0.58	2 (5.7%)	6.50	0.71
Gender	Male	14 (40.0%)	5.86	4.05	14 (40.0%)	4.57	2.03
	Female	21 (60.0%)	6.90	4.11	21 (60.0%)	5.43	3.54
Percentage of previous year	51- 60%	21 (60.0%)	4.36	3.83	7 (20.0%)	5.00	2.38
	61-75%		7.81	3.60	24 (68.6%)	5.08	3.31
	Above 75%	3 (8.6%)	5.00	5.57	4 (11.4%)	5.25	2.87
Have you ever been posted to Cardiac unit	Yes	24 (68.6%)	6.79	3.65	19 (54.3%)	4.81	2.43
	No	11 (31.4%)	5.82	4.98	16 (45.7%)	5.32	3.50
Father's Occupation	Others	32 (91.4%)	6.47	4.24	31 (88.6%)	4.90	3.16
	Health Care professional	3 (8.6%)	6.67	1.15	4 (11.4%)	6.50	1.00
Mother's Occupation	Others	32 (91.4%)	6.41	4.16	32 (91.4%)	5.06	3.12
	Health Care professional	3 (8.6%)	7.33	3.21	3 (8.6%)	5.33	2.08
Prior Knowledge about ECG interpretation	No	35 (71.4%)	6.00	4.39	28 (80.0%)	4.75	3.26
	Yes	10 (28.6%)	7.70	2.95	7 (20.0%)	6.43	1.13
Have you done any online education before	No	26 (74.3%)	6.23	4.36	32 (91.4%)	4.97	3.13
	Yes	9 (25.7%)	7.22	3.15	3(8.6%)	6.33	1.15

The data collected was tabulated. Coded and interpreted using spss software and was done by the blinded statistician. The socio demographic profile showed the following results. (Refer table 1). Age of the study participants in experimental group was majorly in age of 19 (37.1%) to 20 years (40%) on other hand control group had majority participants of 21years (60%) and 60% of study participants were females in both experimental and control group.

The percentage of previous year was 61-75% among both the experimental (60%)and control group 68.6%. Study participants who had their clinical postings completed were 68.6% in experimental group and in control group 54.3% had completed the posting.

Participants' parents who belonged to health care profession were 8.6% among experimental group where as control group participants had father in health care profession (11.4%) and mothers who were health care professional were 8.6%.

Prior knowledge was absent among the participants similarly, majority of participants of experimental group 74.3% and 32.96% in control group had not done nay online education related to the ECG interpretation (refer table 1)

Assess and compare acquisition and retention of ECG interpretation skill before and after the virtual learning program among nursing students

On comparison of the acquisition and retention of ECG interpretation skill level results revealed pretest knowledge to be same that is Average (11-20) among both experimental (57%)and control group (54.3%) However it raised to above average among experimental group 97.1% participants immediately after the Virtual learning program. The retention of skill was assessed after 15 and 30 days it was found that experimental group participants had above average retention of ECG interpretation skill. second assessment revealed that cent percent experimental group participant had above average skill. On other hand the acquisition & retention of ECG interpretation skill remained at same level i.e, average even on further two assessments done of 15th and 30th day (refer table 2)

Therefore, the inference was drawn that Virtual learning program helped experimental group participants to gain and retain the ECG interpretation skill.

Table 2. Comparison Of Acquisition and Retention of Ecg Interpretation Skill Level Score Among Exp and Control Group N=70

VARIABLES	Score range	EXP Fr (%)	CONTROL Fr (%)
Pretest knowledge	Below average (0-10)	7(20.0%)	7 (20.0%)
			19 (54.3%)
	Above Average (21-30)	8 (22.0%)	9 (25.7%)
Knowledge & retention - POST 1	Below average (0-10)	0 (0.0%)	3 (8.6%)
	Average (11-20)	1 (2.9%)	29 (82.9%)
	Above Average (21-30)	34 (97.1%)	3 (8.6%)
Knowledge & retention - POST 2	Below average (0-10)	0 (0.0%)	2 (5.7%)
	Average (11-20)	0 (0.0%)	30 (85.7%)
	Above Average (21-30)	35 (100.0%)	3 (8.6%)
Knowledge & retention - POST 3	Below average (0-10)	0 (0.0%)	2 (5.7%)
	Average (11-20)	2 (5.7%)	29 (82.9%)
	Above Average (21-30)	33 (94.3%)	4 (11.4%)

Retention of ECG interpretation skill was assessed statistically using ANOVA and the calculated value for experimental group (2.694) was found to be significant (refer table 3) in comparison to control group where it was found to be (1.671) non-significant (refer table 4).

Hence, the conclusion was drawn that the virtual learning program helped the experimental group to acquire and retain the ECG interpretation skill.

Table 3. Comparison Of Mean Scores of Acquisitions and Retention of Ecg Interpretation Skill With In The Experimental Group N = 70

ANOVA	PRE	POST 1	POST 2	POST 3
Mean	18.31	31.63	32.31	31.23
S.D.	8.098	4.271	2.349	3.695
F Test	68.20			
P value	2.694			
Result	Significant			

Table 4. Comparison Of Mean Scores Of Knowledge Acquisition And Retention Of Ecg Interpretation Skill With In The Control Group N = 70

ANOVA	PRE	POST 1	POST 2	POST 3
Mean	16.71	16.26	15.80	15.83
S.D.	6.052	3.837	3.359	3.249
Median	15	17	16	16
F Test	0.52			
P value	1.671			
Result	Not Significant			

Doi.org/10.31838/hiv22.02.797 Received: 22.07.22, Revised: 13.08.22, Accepted: 11.09.22

Determine association of acquisition and retention of ECG interpretation skill with selected variables among nursing students.

In order to establish the fact that the virtual learning program was solely responsible for the acquisition and retention of ECG interpretation skill, association was calculated using chi square test. It was revealed that none of the socio demographic variable had significant chi square value. Hence the conclusion was outlined that the socio demographic variable did not affect the acquisition and retention of experimental group participants. (refer table 5), it was only influenced or caused by Virtual learning program.

Table 5. Association Of Acquisition and Retention of Ecg Interpretation Skill Score With Demographic Variables In Experimental Group

Demographic Variables		Level of Scores							
Variables	Opts	Below Average (0-10)	Average (11-20)	Above average (21-30)	Chi value	P Value	df	Table Value	Result
Age in Years	19yrs	0	1	12	5.815	0.444	6	12.592	Not Significant
	20yrs	0	1	13					
	21yrs	0	0	5					
	22yrs & above	0	0	3					
Gender	Male	0	2	12	1.667	0.435	2	5.991	Not Significant
	Female	0	0	21					
Percentage of previous year	51- 60%	0	1	10	6.753	0.150	4	9.488	Not Significant
	61-75%	0	1	20					
	Above 75%	0	0	3					
Have you ever been posted to Cardiac unit	Yes	0	2	22	4.176	0.124	2	5.991	Not Significant
	No	0	0	11					
Father's Occupation	Health Care professional	0	1	31	1.276	0.528	2	5.991	Not Significant
	Others	0	1	2					
Mother's Occupation	Health Care professional	0	2	30	1.276	0.528	2	5.991	Not Significant
	Others	0	0	3					
Prior Knowledge about ECG interpretation	No	0	1	24	3.500	0.714	2	5.991	Not Significant
	Yes	0	1	9					
	No	0	2	24	3.216	0.200	2	5.991	Not Significant
	Yes	0	0	9					

Discussion & Conclusion

As statistical data showed significant difference between level of scores and mean scores of experimental and control groups in terms of acquisition and retention of ECG interpretation skill it was concluded that Virtual learning program successfully helped the experimental group participants to acquire and retain the ECG interpretation skill. Montassier E too reported that the e-learning course is an effective tool for the acquisition of ECG interpretation skills by medical students. Furthermore, Internet-delivered education may be more effective than traditional teaching methods due to greater immediacy, improved visualisation and interactivity [30]. Baccalaureate students ranked the Web-based ECG-interpretation programme as a useful instrument to learn ECG. Furthermore, Internet-delivered education may be more effective than traditional teaching methods due to greater immediacy, improved visualisation and interactivity [31]

4. Acknowledgements

I would like to thank my guide for continuous support and guidance, without which this study wouldn't have been possible.

Conflict of interest – no conflict of interest

References

Shanthi Mendis; Pekka Puska; Bo Norrving; World Health Organization (2011). Global Atlas on Cardiovascular Disease Prevention and Control (PDF). World Health Organization in collaboration with the World Heart Federation and the World Stroke Organization. pp. 3–18. ISBN 978-92-4-156437-3.

Srinath Reddy K, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. Lancet. 2005;366:1744–1749.

Joshi P, Islam S, Pais P, Reddy S, Dorairaj P, Kazmi K, Pandey MR, Haque S, Mendis S, Rangarajan S, Yusuf S. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. JAMA. 2007;297:286–294.

Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, Gupta R, Joshi P, Kerkar P, Thanikachalam S, Haridas KK, Jaison TM, Naik S, Maity AK, Yusuf S; CREATE registry investigators. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. Lancet. 2008;371:1435–1442.

Harikrishnan S, Leeder S, Huffman M, Jeemon P, Prabhakaran D. A Race against Time: The Challenge of Cardiovascular Disease in Developing Economies. 2nd ed. New Delhi, India: New Delhi Centre for Chronic Disease Control; 2014.

Yusuf S, Rangarajan S, Teo K, Islam S, Li W, Liu L, Bo J, Lou Q, Lu F, Liu T, Yu L, Zhang S, Mony P, Swaminathan S, Mohan V, Gupta R, Kumar R, Vijayakumar K, Lear S, Anand S, Wielgosz A, Diaz R, Avezum A, LopezJaramillo P, Lanas F, Yusoff K, Ismail N, Iqbal R, Rahman O, Rosengren A, Yusufali

A, Kelishadi R, Kruger A, Puoane T, Szuba A, Chifamba J, Oguz A, McQueen M, McKee M, Dagenais G; PURE Investigators. Cardiovascular risk and events in 17 low-, middle-, and high-income countries. N Engl J Med. 2014;371:818–827. doi: 10.1056/NEJMoa1311890.

Prabhakaran D, Yusuf S, Mehta S, Pogue J, Avezum A, Budaj A, Cerumzynski L, Flather M, Fox K, Hunt D, Lisheng L, Keltai M, Parkhomenko A, Pais P, Reddy S, Ruda M, Hiquing T, Jun Z. Twoyear outcomes in patients admitted with non-ST elevation acute coronary syndrome: results of the OASIS registry 1 and 2. Indian Heart J. 2005;57:217–225.

Global Atlas on Cardiovascular Disease Prevention and Control. Geneva, Switzerland: World Health Organization; 2011.

Institute of Health Metrics and Evaluation. GBD Profile: India. http:// www.healthdata.org/sites/default/files/files/country _profiles/GBD/ihme_ gbd_country_report_india.pdf. Accessed April 30, 2014.

Patel V, Chatterji S, Chisholm D, Ebrahim S, Gopalakrishna G, Mathers C, Mohan V, Prabhakaran D, Ravindran RD, Reddy KS. Chronic diseases and injuries in India. Lancet. 2011;377:413–428. doi: 10.1016/ S0140-6736(10)61188-9.

Report on Causes of Death in India 2001–2003. New Delhi, India: Office of the Registrar General of India; 2009.

Goldman L, Saison R, Robbins S, Cohn LM, Bettmam M, Weisberg M. The value of the autopsy in 3 medical eras. N Engl Journal of Medicine 1983; 308:1000-1005.

Lehmann MH, Suzuki F, Fromm SB, Frankovich D, Elko P, Steinman RT, Fresard J, Baga JJ, Taggart TR. T wave "Humps" as a potential electrocardiographic marker of the long QT syndrome. American Journal 1994; 24:746-754.

Brannigan, D. Cardiac Monitors - friends or foe. Nursing Times January 1984; 25-26.

56Karthryn Bachanan keller, Deborah A Raines, Boca Raton, Arrhythmia knowledge: A qualitative study,Heart & Lung 2005, 34, (5)

68 Brannigan D, Barbara Drew, Cardiac Monitors - friends or foe. Nursing Times 1984 January; 24(8): 25-26.

Yaghoubi M, Javadi M, Rakhsh F, Bahadori M. A study of determining factors affecting the performance of nurses based on the achieve model in selected hospital of Isfahan (Iran). J Educ Health Promot. 2013;2:49.

Gerdeman JL, Lux K, Jacko J. Using concept mapping to build clinical judgment skills. Nurse Educ Pract. 2013;13(1):11–7.

Glynn DM. Clinical judgment development using structured classroom reflective practice: a qualitative study. J Nurs Educ. 2012;51(3):134–9.

Traynor M, Boland M, Buus N. Professional autonomy in 21st century healthcare: nurses' accounts of clinical decision-making. Soc Sci Med. 2010;71(8):1506–12.

Skar R. The meaning of autonomy in nursing practice. J Clin Nurs. 2010;19(15-16):2226–34.

Gillet N, Colombat P, Michinov E, Pronost AM, Fouquereau E. Procedural justice, supervisor autonomy support, work satisfaction, organizational identification and job performance: the mediating role of need satisfaction and perceived organizational support. J Adv Nurs. 2013;69(11):2560–71.

10Thompson C, Yang H, Crouch S. Clinical simulation fidelity and nurses' identification of critical event risk: a signal detection analysis. J Adv Nurs. 2012;68(11):2477–85.

Kantar L, Alexander R. Integration of clinical judgment in the nursing curriculum: challenges and perspectives. J Nurs Educ. 2012;51(8):444–53.

Jerak-Zuiderent S. Certain uncertainties: modes of patient safety in healthcare. Soc Stud Sci. 2012;42(5):732–52

Victor-Chmil J, Larew C. Psychometric properties of the lasater clinical judgment rubric. Int J Nurs Educ Scholarsh. 2013;10.

Fero LJ, O'Donnell JM, Zullo TG, Dabbs AD, Kitutu J, Samosky JT, et al. Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. J Adv Nurs. 2010;66(10):2182–93.

Mary G. Adams-Hamoda, Mary A. Caldwell, Nancy A, Barbara J. Drew. American Journal of Critical Care 2003; 12: 9-16.

Leonard, B. (1996), "Distance learning: work and training overlap", HR Magazine, Vol. 4 No. 4

Montassier E, Hardouin JB Segard J, Batard E, Potel G, Planchon B, Trochu JN, Pottier P, E-Learning versus lecture-based courses in ECG interpretation for undergraduate medical students: a randomized noninferiority study, Eur J Emerg MeD. 2016 Apr;23(2):108-13.

Mikael Nilsson, Gunilla Bolinder, Claes Held, Bo-Lennart Johansson, Uno Fors and Jan Östergren, BMC Medical Education 2008, 8:25