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## Introduction

Interpreting an electrocardiogram (ECG) is an essential competency for nurses. In addition, self-confidence of performance regarding ECG monitoring is essential to achieving positive results for nurses of patients with heart problems. Emergency department and intensive care unit nurses often care for patients with heart problems, and there is a high demand for emergency and crisis nursing professionals. To effectively increase nurses' capability in ECG monitoring, it is necessary to cultivate up-to-date knowledge on systematic education and actual clinical training.

## Purpose

This cross-sectional study aims to identify the influencing factors of self-confidence of performance regarding ECG monitoring of emergency department and intensive care unit nurses and to identify educational needs related to ECG monitoring.

## Methods

❖ **Design** : Cross-sectional descriptive study design

❖ **Subjects**

The subjects of this study were 153 nurses working in one emergency room and four intensive care units at C University Hospital located in G city.

❖ **Instruments**

The structured questionnaire included knowledge, self-confidence, and educational needs related to ECG monitoring.

❖ **Data Analysis** : The data were analyzed using descriptive statistics, t-test, ANOVA, Pearson correlation, multiple regression, and Eisenhower matrix analysis using the SPSS 26.0 program.

## Results

### General characteristics of participants

- Gender: Women (n=144, 94.1%), Men (n=9, 5.9%)
- Mean age = 29.7 (± 6.2) years
- Clinical experience=mean 78.3 months
- Department: ED (n=40, 26.1%), EICU (n=23, 15.1%), MICU (n=21, 13.7%)  
NCU (n=34, 22.2%), SCIU (n=35, 22.9%)

### Self-confidence of performance regarding ECG monitoring by the characteristics of participants

Variables	Categories	n(%)	Self-confidence (N=153)					
			Understanding ECG		Applying nursing practice		Total	
			M±SD	t or F (p)	M±SD	t or F (p)	M±SD	t or F (p)
<b>general characteristics</b>								
Gender	Female	144(94.1)	36.96±9.41	-0.98 (.328)	26.25±3.79	-0.57 (.572)	63.21±15.21	-0.86 (.392)
	Male	9(5.9)	40.11±8.25		27.56±4.93		67.67±12.90	
Age(year)	20-25	40(26.1)	36.08±10.42		23.98±7.32		60.05±17.31	
	26-30	63(41.2)	36.81±8.03	1.18 (.320)	27.25±6.24	3.05 (.030)	64.06±12.88	1.80 (.150)
	31-35	28(18.3)	40.07±8.57		28.25±4.98		68.32±12.64	
	≥36	22(14.4)	36.32±11.47		25.50±7.67		61.82±18.40	
Education	Bachelor	135(88.2)	36.92±8.84	-0.62 (.544)	26.38±6.52	-0.27 (.785)	13.14±3.03	1.41 (.162)
	≥Master	18(11.8)	38.83±12.73		26.83±7.16		12.06±3.40	
Religion	Yes	35(22.9)	37.60±10.86	0.33 (.744)	25.91±7.28	-0.41 (.679)	63.51±17.19	0.02 (.985)
	No	118(77.1)	37.01±8.90		26.45±6.53		63.46±14.49	
<b>clinical characteristics</b>								
Working department	ED	40(26.1)	35.48±9.49		24.60±7.30		60.08±15.50	
	EICU	23(15.1)	35.87±10.17		26.70±5.72		62.57±15.34	
	MICU	21(13.7)	32.90±9.72	3.10 (.018)	24.43±7.01	1.79 (.134)	2.85 (.026)	
	NCU	34(22.2)	39.59±8.72		27.41±6.84		67.00±14.90	
Position	Staff nurse	145(94.8)	36.99±9.43	-0.85 (.398)	26.20±6.65	-1.00 (.320)	63.19±15.10	-0.97 (.334)
	Charge nurse	8(5.2)	39.88±7.85		27.63±7.41		68.50±14.81	
Work shift	3-shift	143(93.5)	36.80±9.34	-1.71 (.089)	26.15±6.69	-1.26 (.210)	62.95±15.06	-1.62 (.107)
	day 2-shift	10(6.5)	42.00±8.51		28.90±6.57		70.90±14.25	
Total clinical Career	< 3 year	40(26.1)	35.95±10.33	-0.94 (.349)	23.97±6.75	-2.77 (.006)	59.58±16.95	-1.92 (.057)
	≥3 year	113(73.9)	37.57±8.99		27.28±6.33		64.85±14.20	
Clinical career of current Unit	< 3 year	60(39.2)	35.98±9.73	-1.24 (.219)	24.69±6.61	-2.65 (.009)	60.43±15.99	-2.02 (.045)
	≥3 year	93(60.8)	37.89±9.07		27.54±6.35		65.43±14.22	
<b>Characteristics of using evidence related to ECG monitoring</b>								
Frequency of Using searching Database	< once a month	66(43.1)	34.73±8.84	-2.85 (.005)	25.26±7.14	-1.73 (.085)	59.98±14.81	-2.53 (.012)
	≥once a month	87(56.9)	38.99±9.36		27.14±6.28		66.11±14.84	
Experience of Education	Yes	64(41.8)	38.77±9.99	1.83 (.069)	27.97±6.15	2.62 (.010)	66.73±15.12	2.30 (.023)
	No	89(58.2)	35.98±8.73		25.15±6.84		61.12±14.71	
Education period (n=64)	< 2 year	29(45.3)	42.52±8.98	2.89 (.005)	29.17±5.22	1.44 (.156)	71.69±13.47	2.48 (.016)
	≥2 year	35(54.7)	35.66±9.83		26.97±6.74		62.63±15.35	
Related Certificate	Yes	111(72.5)	37.63±9.48	1.05 (.297)	26.39±6.73	0.18 (.856)	64.02±15.27	0.73 (.467)
	No	42(27.5)	35.86±8.97		26.17±6.67		62.02±14.68	
Certificate update Period (n=111)	< 1 year	3(2.7)	44.33±9.29	1.24 (.216)	29.00±7.00	0.68 (.498)	73.33±16.29	1.07 (.286)
	≥1 year	108(97.3)	37.44±9.46		26.31±6.74		63.76±15.24	

## Results

### Correlation between Knowledge, self-confidence of performance regarding ECG monitoring

Variables	Self-confidence						
	Understanding ECG		Applying nursing practice		Total		
	r	p	r	p	r	p	
knowledge	Characteristics of normal wave	.24	.003	.17	.040	.22	.005
	Characteristics of abnormal waves	.17	.042	.19	.020	.19	.022
	Visual presentation	.03	.743	.09	.295	.05	.505
Total	.18	.023	.19	.016	.20	.013	

### Factors Influencing self-confidence of performance regarding ECG monitoring

Variables	Self-confidence														
	Understanding ECG					Applying nursing practice					Total				
	B	S.E	β	t	p	B	S.E	β	t	p	B	S.E	β	t	p
(Constant)	27.71	3.31		8.38	<.001	18.12	2.35		7.71	<.001	45.83	5.27		8.69	<.001
knowledge	0.28	0.24	.09	1.17	.245	0.20	0.17	.09	1.18	.239	0.47	0.38	.10	1.26	.210
Experience of education <sup>*</sup>	3.20	1.44	.17	2.22	.028	2.96	1.03	.22	2.89	.004	6.16	2.30	.21	2.68	.008
Frequency of searching database	3.61	1.46	.20	2.47	.015	1.43	1.04	.11	1.38	.171	5.05	2.34	.17	2.16	.032
Clinical career of current unit <sup>*</sup>	2.22	1.45	.12	1.53	.129	3.17	1.03	.24	3.06	.003	5.39	2.32	.18	2.32	.022
Working department <sup>*</sup>	1.77	1.66	.09	1.07	.288	2.37	1.18	.16	2.02	.046	4.14	2.64	.12	1.57	.119
R <sup>2</sup> =.113, adj.R <sup>2</sup> =.082, F=3.71, p=.003, Durbin-Watson=1.932															
R <sup>2</sup> =.163, adj.R <sup>2</sup> =.134, F=5.69, p<.001, Durbin-Watson=1.972															
R <sup>2</sup> =.145, adj.R <sup>2</sup> =.116, F=4.95, p<.001, Durbin-Watson=1.917															

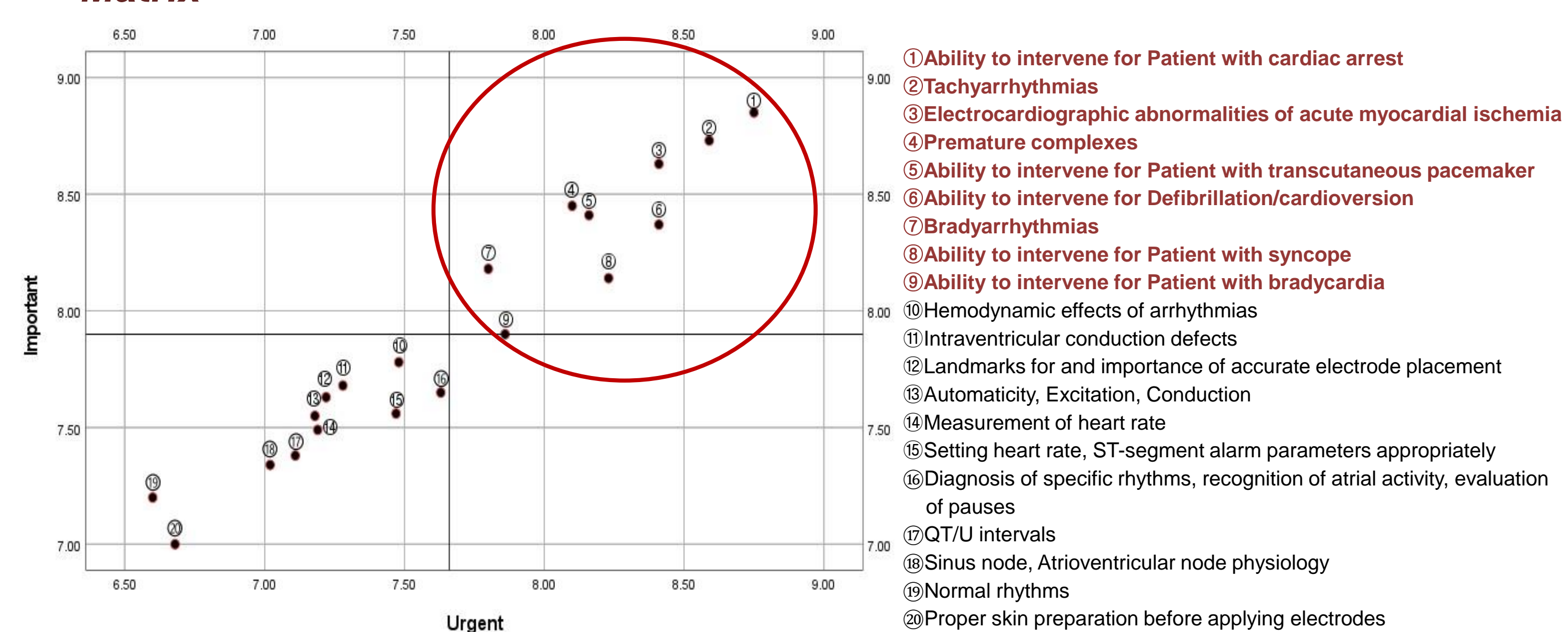
SE=Standard error, Dummy variable: Frequency of using searching database= < once a month, Experience of education=No, Working department=ED, Clinical career of current unit= < 3 year

Factors affecting self-confidence in performing ECG monitoring were 'completion of education on ECG monitoring' (β=.21, p=.008), 'frequency of searching for up-to-date evidence' (β=.17, p=.032), and 'clinical experience in current department' (β=.18, p=.022). The explanatory power of the model was 14.5%.

### Educational Needs about ECG monitoring

Contents	Categories	n	%	M±SD
Necessity of ECG monitoring education	Is not necessary at all	0	0.0	
	Not necessary	0	0.0	
	Moderate	7	4.6	
	Necessary	40	26.1	
	Very necessary	106	69.3	
related Education Participation Decision	Is not Participation at all	0	0.0	
	Not Participation	2	1.3	
	Moderate	13	8.5	
	Participation	52	34.0	
	Very Participation	86	56.2	
Appropriate times for training (year)				1.99±1.91(time)
Appropriate time per session for training (time)				1.99±1.31(hour)
Preferred Education Method	Lecture	58	33.5	
	Online	67	38.7	
	Simulation	35	20.2	
	VR(AR)	3	1.7	
	Practicum using Standardized Patients	10	5.8	

### Prioritized ECG monitoring educational content areas using the Eisenhower Matrix



## Conclusions

The results of this study show that a systematic and continuous educational intervention program based on the needs of nurses is needed to improve their self-confidence of performance regarding ECG monitoring in the emergency department and intensive care units. We found it essential to include high-priority training topics within the program and improve nurses' access to the latest evidence in the clinical field. In addition, there is a need for a practical strategy to strengthen their self-confidence of performance regarding ECG monitoring, such as accumulating experience in nursing patients with heart problems in clinical practice. These efforts will enable nurses to care for patients with heart problems with greater self-confidence.