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Verification of Reliability and Validity of K-SART to Assess of Situational Awareness of Patients with Acute Coronary Syndrome

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급성관상동맥증후군 환자의 상황인식 측정을 위한 K-SART의 신뢰도와 타당도 검증

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Abstract The purpose of this study was to test the reliability and validity of the SART(Situation Awareness Rating Technique) tool to measure the situational awareness of patients with acute coronary syndrome. The translated SART was tested on 118 hospitalized patients with acute coronary syndrome to verify the reliability and validity of the tool. The analysis was conducted with Cronbach's alpha, exploratory & confirmatory factor analysis. Study findings found that the tool's reliability and model fit index improved when the two problematic items, namely, Situation Awareness 1 (Instability of Situation) and Situation Awareness 7 (Spare Mental Capacity) were removed. According to the results, the revised K-SART is deemed to be an appropriate method for assessing the degree of situational awareness of patients with acute coronary syndrome in decision making about treatment-seeking.

Key Words : Acute Coronary Syndrome, Situation Awareness, Decision Making, Treatment Seeking Behavior, Measurement Tool

요 약 이 연구는 급성관상동맥증후군을 경험한 환자의 상황인식 수준 측정을 위한 SART 도구의 신뢰도와 타당도를 검증하기 위해 시도되었다. 입원한 급성관상동맥증후군 환자 118명에게 번역된 SART 도구를 적용하여 도구의 신뢰도와 타당도를 분석하였다. 도구의 신뢰도와 타당도는 Cronbach 알파, 탐색적, 확인적 요인분석을 통해 분석하였다. 연구 결과 상황 인식 1(Instability of Situation, 상황의 불안정성)과 상황 인식 7(Spare Mental Capacity, 여분의 정신력)의 두 문항을 제거하였을 때 도구의 신뢰도와 모델 적합도 지수가 향상되는 것으로 나타났다. 수정된 국문판 SART는 급성관상동맥증후군 환자의 치료추구행동에 대한 의사결정 시 상황인식 정도를 측정하는 데 적절한 도구로 판단된다.

주제어 : 급성관상동맥증후군, 상황인식, 의사결정, 치료추구행위, 측정도구

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1. Introduction

An Acute coronary syndrome (ACS) is a condition in which intravascular thrombosis occurs as a result of the rupture of an atherosclerotic plaque. It is divided into unstable angina, non-ST segment elevation myocardial infarction, and ST segment elevation myocardial infarction[1]. These diseases progress rapidly and require prompt treatment. In particular, in ST-segment elevation myocardial infarction, the short-term and long-term prognosis and results are determined by how quickly the blood flow of the infarcted artery is restored after the onset of symptoms and it is important to seek medical help and receive appropriate treatment at an early stage through rapid recognition and judgment of symptoms[2]. In patients with acute myocardial infarction, delays in making decisions leading to treatment delay are the main reason for improper reperfusion therapy[3, 4] and it is important to reduce delays in seeking treatment through accurate and rapid decision-making.

Almost all domestic and international studies on reasons for delaying treatment seeking are simply descriptive in nature, investigating factors that decrease or increase time delay[5-7], and they explain the behaviors of treatment seeking by applying a theory based on the motivation theory[7, 8]. However, the decision to go to the hospital after the onset of coronary artery disease suddenly involves information about an event that occurred in a natural state, cognitive decision-making through processing, and the same influencing factors and circumstances, and different choices can be made depending on the decision-making result[8]. Therefore, it is necessary to look at the cognitive decision-making part of the decision-making process before simply examining the factors that affect the delay in treatment-seeking behavior.

The term of situation awareness was first derived from military theory, where situational awareness is the ability to recognize, understand, and predict situations based on correct information in an urgent situation, such as a plane-to-plane combat situation, to make quick decisions in the future and it is an essential element of planning [10] In this sense, it was applied to Korean patients with acute coronary syndrome in that it is similar to the situation in which situational awareness is essential in decision making on the act of seeking treatment to go to the hospital in an urgent situation where coronary syndrome is progressing[11].

It is evident that situational awareness is important in the decision-making process regarding the initiation of treatment in patients with acute coronary syndrome, as incorrect decision-making could lead to increased mortality and poor outcomes[12]. Recently, research on situational awareness is being conducted in various fields such as air traffic control, car or motorcycle control, fire suppression, and simulation practice[13].

As an objective and subjective tool for assessing situational awareness, Taylor (1990)'s SART (Situation Awareness Rating Technique) is widely used because it includes a number of factors related to situational awareness, in other words, perception of situation, comprehension of situation and projection of future status. It is inexpensive, and is easy to use with 10 items and used for many types of areas where bad decisions can have serious consequences, such as flying an airplane, fighting a fire, or treating a seriously ill patient[14]. It is considered that the use of the SART tool is appropriate because an objective tool that measures real-time cannot be used because it is impossible to measure the situational awareness at the time of symptom onset in real time at the time of symptom onset.

Hence, in this study, it was investigated whether the SART tool, which is used across many types of fields, can be used to measure the situational awareness level of Korean acute coronary syndrome patients. For this purpose, the reliability and validity of the tool were verified by translating the original tool into Korean and applying it to patients with acute coronary syndrome.

2. Materials & Methods

2.1 Research Design

This is a methodological study to evaluate the reliability and validity of the translated and modified SART tool developed by Taylor(2017)[14] in measuring the situational awareness of patients with acute coronary syndrome.

2.1.1 Data Analysis

The data were analyzed through the SPSS 20.0 and AMOS 20.0 programs, and the reliability and validity of the modified tool were analyzed through Cronbach's Alpha, exploratory factor analysis(EFA), and confirmatory factor analysis(CFA). For exploratory factor analysis, principal component analysis was used, and a varimax method was adopted to simplify factor loading. Confirmatory factor analysis was confirmed through $\chi 2$, $\chi 2/df$, AGFI, GFI, RMR, SRMR, RMSEA, TLI, NFI, CFI and PNFI using AMOS 20.0.

2.1.2 Research Subjects and Data Collection Method

The subjects of this study were patients diagnosed with acute coronary syndrome and were physically stable after percutaneous coronary intervention(PCI) for treatment. Those who could not confirm the onset of symptoms or were unable to communicate, those who visited the hospital due to loss of consciousness or other reasons, were excluded from the subjects. With approval from the Institutional Review Board (IRB) of Medical Graduate School of University C (No. 11-30) and obtaining permission from the university hospital to collect data, the researcher and five educated research assistants conducted direct interviews for nine months. A total of 145 were made through direct interview, but the data of a total of 118 people were used for the final analysis, excluding 27 copies with ambiguous timing of symptom onset or not suitable for the inclusion criteria. Subjects voluntarily consented to participate in the study and could withdraw at any time. For the number of samples, exploratory factor analysis(EFA) requires a 1:10 ratio of the number of questions to the number of participants[15], Bentler & Chou (1988)[16] 5 times the free parameter, and Kim(2011)[17] says that 100-200 perple are appropriate. Based on the above, the sample size was satisfied with 10 observation variables of this tool.

2.2 Measurement Tool

2.2.1 General Characteristics

A structured questionnaire was used on subjects' general characteristics (gender, age, marital status, educational level, religion, occupation, diagnosis, etc.).

2.2.2 SART(Situation Awareness Rating Technique) Tool

SART tool is developed by Taylor (2017)[14] based on Endsley (1995)'s situational awareness theory[18]. Among various tools for measuring situational awareness, SART is subjective and has a disadvantage in that it is difficult to measure individual items. However, it is widely used because it has no effect on the job and can be easily used for situation evaluation compared

to other evaluation tools. At the time of development, the overall reliability of the tool was Cronbah's alpha 0.819, and the reliability of each component was found to be 0.832 to 0.970, which is higher than that[19]. SART (Situation Awareness Rating Techniqe) consists of 10 questions and it consists of 3 sub-factors: Demand of Attention(Demand), Supply of Attention(Supply), and Understand of Situation(Understand). It is subdivided into 10 items: situational instability, situational complexity, situational variability, arousal, concentration of attention, division of attention, spare mental capacity, information quantity, information quality, and familiarity with situation. It is calculated by the formula of U-(D-S), and the higher the score, the higher the situational awareness score. Each question was first translated by the researcher and then revised several times with the guidance of a nursing professor who is an expert in this field. After that, the modified translated tool was consulted on reverse translation by a nurse with a master's qualification and bilingual who has lived in the United States for more than 20 years and is currently working as an outcome coordinator at hospital and Content validity was verified by two internal medicine doctors.

3. Results and Discussion

3.1 Results of the Research

3.1.1 The General Characteristics of the Participants

The demographic characteristics of the subjects who participated in the study are as follows. A total of 118 subjects were studied, including 82 males (69.5%) and 36 females (30.5%). The average age was 65.24, 53 (44.9%) of young-old aged 65-74, 22 (18.6%) of middle-old aged 75-84 and there were 4 (3.4%) of the elderly (oldest-old) over 85 years old. As for the study subjects, STEMI (ST-elevation myocardial infarction) was the most common diagnosis with 63 (53.4%), followed by Unstable angina with 31 (26.3%) and NSTEMI with 19 (16.1%).

3.1.2 The Reliability and Validity in Korean Version of SART for Measuring Situational Awareness in Patients with Acute Coronary Syndrome

Reliability was analyzed to check the internal consistency of the tool. The overall reliability of the scale was Cronbach's α = .765, and the sub-factor reliability was .86 for Understanding of situation, .77 for Supply of attention, and .63 for Demands on attention as shown Table 1.

Both exploratory factor analysis and a definitive factor analysis were conducted to evaluate the reliability and validity of the measurement tools, although the situation is similar to that of patients with acute coronary syndrome, since the tool was first developed for aviation and is being used for the first time. Exploratory factor analysis is often used as a pre-stage of confirmatory factor analysis, and it is carried out for exploratory purposes in order to grasp the direction of future research in studies that have not yet been systematically or established in theory, and verified by confirmatory factor analysis and can lead to more reliable conclusions.

First, the Kaiser-Meyer-Olkin (KMO) measurement result to determine whether the data is appropriate for factor analysis was .738, which was appropriate for the selection of variables, and Bartlett's sphericity test was chi-square 508.784($p < .001$) is appropriate and it can be concluded that a common factor exists.

For all measurement variables, principal component analysis was used to extract the component factors, and the varimax method was adopted to simplify the factor loading. Factor loading indicates the degree of correlation

Table 1. Exploratory Factor Analysis and Reliability of SART(N=118)

	Factor analysis				Reliability	
	Factor loading					
	Factor 1	Factor 2	Factor 3	Correlated item-total correlation	α if Item Deleted	Cronbach's α
SA 8	.896			.855	.723	
SA 9	.884			.853	.725	.860
SA 10	.813			.684	.768	
SA 6		.803		.724	.713	
SA 4		.770		.662	.725	.773
SA 7		.709		.515	.767	
SA 5		.682		.644	.718	
SA 3			.834	.706	.769	
SA 1			.727	.567	.789	.628
SA 2			.663	.607	.740	
Eigen-value	2.588	2.480	1.750			
Accumulative variance(%)	25.875	24.799	17.5			

Kaiser-Meyer-Olkin(KMO)=.738;Bartlett's test of sphericity :x2=508.784; p<.001; Cronbach's α= .765(Cronbach's α = .797 if item #1, 7 are deleted)
Factor 1 : Understanding of Situation, Factor 2 : Supply of Attentional Resources, Factor 3 : Demands on Attentional Resources. SA(Situation Awareness)
SA1 : Instability of Situation, SA2 : Complexity of Situation, SA 3 : Variability of Situation, SA 4 : Arousal,
SA 5 : Concentration of Attention, SA 6 : Division of Attention, SA7 : Spare Mental Capacity,
SA 8 : Information Quantity, SA 9 : Information Quality, SA 10 : Familiarity with Situation

between each variable and factor. Therefore, each variable belongs to the factor with the highest factor loading. In addition, the eigenvalue refers to the sum of the squares of the loadings of all variables loaded on a specific factor, and refers to the standardized variance related to a specific factor. In this tool, all ten SART items had eigenvalues of 1.0 or higher and factor loading values of 0.40 or higher.

The total variance explained was 68.17%. Overall, situational awareness was extracted with three factors like the theoretical structure of previous research results. The extracted factors were named Demands on attentional resources, Supply of attentional resources, and Understanding of situation, as in the original tool. It was confirmed that Attention demand (Factor 3) was consist of 3 items as instability of situation(SA1), complexity of situation(SA 2), and variability of situation(SA 3), and Supply of attentional resource(Factor 2) was consist of 4 items as arousal(SA 4), concentration of attention(SA 5), division of attention(SA 6), spare mental capacity(SA 7), Understanding of situation(Factor 1) was consist of 3 items as the amount of information (SA 8), and the quality of the information (SA 9) and familiarity with the situation (SA 10).

In order to better understand the relationships between the latent variable and the measurement variables that measure it, and to determine which factors hinder dimensionality, a confirmatory factor analysis was performed as shown in Fig. 1.

To confirm the standardization coefficient, a reference variable setting method was applied. As a result of the exploratory factor analysis of situational awareness, Variability of the Situation(SA 3), Division of Attention(SA 6), and Information Quantity(SA 8) had the largest factor loading values, so they were set as reference variables and the parameters were fixed at 1.0. Afterwards, standardized regression coefficients and statistical significance of the remaining variables were confirmed. Then, the latent variable standardization method was performed as shown in Table 2 to confirm the factor loading and statistical significance of the

Table 2. Parameter Estimate for Confirmatory Factor Analysis of Situation Awareness (N=118)

Endogenous variable	Exgenous variable	Standardized coefficient(γ)	S.E.	C.R.	SMC
Demands on attentional resources (Factor 3)	Instability (SA1)	.288	.230	2.743**	.288
	Complexity (SA2)	.860	.340	6.494***	.860
	Variability (SA3)	.554	.280	4.954***	.554
	Arousal (SA4)	.795	.240	9.483***	.795
Supply of attentional resources (Factor 2)	Concentration of attention(SA5)	.796	.213	9.495***	.796
	Division of attention(SA6)	.745	.257	8.709***	.745
	Spare mental capacity(SA7)	.358	.234	3.683***	.358
	Information quantity(SA8)	.934	.179	12.753***	.934
Understanding of situation (Factor 1)	Information quality(SA9)	.947	.176	13.036***	.947
	Familiarity with situation(SA10)	.627	.249	7.389***	.627

parameter set as a reference variable that was fixed to 1.0 and could not be confirmed.

As a result, the standardized loading values (coefficients) of SA1 (Instability of Situation) and SA7 (Spare Mental Capacity) were .288 and .358 and both of them are below 0.5, and SMC(Squared multiple correlation), which evaluates the reliability of the observed variables, it is shown in the lowest 0.083 and 0.128 showed that the two questions matter.

Observed variables with low standardization coefficients and low SMC lower the reliability of the measurement of the latent variable called situational awareness, so we checked the fit of the model as shown in Table 3 to determine whether to remove it.

When SA 1 (Instability of Situation) and SA7 (Spare Mental Capacity) items were included, it was found that the model did not meet the fitness criteria in $\chi 2$, $\chi 2$/df, AGFI, GFI, RMR, SRMR, RMSEA, TLI, and NFI. In contrast, when the SA1 (Instability of Situation) and SA7 (Spare Mental Capacity) items were removed, both fitness indexes met the criteria. After removing questions 1 and 7, the overall improvement of the model improved, and Cronba's α, which can see the overall reliability, also improved from .765 to .797. Therefore it is thought that questions 1 and 7 should be removed for the Korean version of the SART tool.

3.2 Discussion of the Research

This study is to verify the reliability and validity of the situational awareness rating technique

Table 3. Model Fit Summary of Measurement Model and Modified Measurement Model (N=118)

	X^2(df) (p)	X^2/ df	GFI	AGFI	RMR SRMR	RMSEA	NNFI (TLI)	NFI	CFI	PNFI
Goodness Evaluation criteria	p≥.05	1~2	≥.9	≥.9	≤ .05 ≤ .08	≤.05	≥.9	≥.9	≥.9	≥.6
Measurement Model	71.44 (32) 〈.001	2.23	.894	.819	.596 .092	.103	.885	.865	.918	.615
Modified Measurement Model	23.15 (18) .185 〉.05	1.29	.953	.907	.408 .056	.049	.996	.981	.988	.610

(SART) tool, which has been used in various fields, including the aviation field, is appropriate for measuring the level of situational awareness required for decision-making for treatment seeking for patients with acute coronary syndrome. Further repeated studies are needed in the future as it is the first attempt to measure situational awareness in decision-making for treatment seeking for patients with acute coronary syndrome, it was mainly studied in the war situation and aviation system at the time of development.

This is thought to be because the question SA 1 (Instability of Situation) itself can be conveyed with a double meaning. For example, thinking that the awareness of the surrounding situation is unstable at the time of symptom occurrence is a factor that can lower situational awareness because it is a situation that requires attention, however, on the other hand, not easily overlooking the problems of the surrounding situation and recognizing that something is unstable can lead to a decision to go to the hospital because the subject does not overlook their problems and takes them seriously. Even in the case of the SA 7 (Spare Mental Capacity) question, when the situation turns urgently, most of the time there is not enough time to focus on anything other than the symptoms that occur to you. However, this can also be interpreted as a double meaning for the subject because focusing only on the immediate problem does not have a negative effect on lowering situational awareness or therapeutic decision-making. Finally, SA 1 (Instability of Situation) and SA 7 (Spare Mental Capacity) were subsequently removed from the test.

Therefore, it is considered to be correct to apply the modified SART in order to check the level of situational awareness in Korean patients with acute coronary syndrome.

In order to reduce the mortality rate and improve the treatment prognosis of patients with acute coronary syndrome, interventions should be conducted in the direction of reducing the decision-making time and helping them to take immediate action. In a study by Henriksson, Lindahl & Larsson (2007)[20], which conducted focus group interviews on the thoughts and actions of patients and their close relatives about their experiences during and after myocardial infarction, found that both patients and their relatives were uncertain about the cause of their symptoms. When felt, this uncertainty leads to interpreting the problem as a less serious situation, and as a result, efforts to reduce discomfort in various ways have resulted in a delay before hospitalization. In other words, this means that treatment may be delayed if the situation is not properly recognized after the onset of symptoms. In addition, there is evidence in the literature that one of the reasons why patients with acute myocardial infarction delay treatment seeking is attributable to the misconception that the symptoms involved are not thought to be related to the heart[5,21]. In addition, as an important factor of delay, among the patient's internal factors (cognitive, emotional, and behavioral factors), the interpretation of the patient's symptoms in particular affects the decision to seek treatment[22]. We support the results of this study that correct and rapid situational awareness, which is an internal processing process, plays a decisive role in seeking treatment. Therefore, to shorten the time before visiting the hospital, it is necessary to prepare an intervention plan to have a proper understanding of surrounding factors and a correct perspective after the onset of symptoms. Since the modified situational awareness tool is considered to be suitable for measuring the level

of situational awareness in situations requiring rapid decision making in Korean patients with acute coronary syndrome, additional repeated studies related to this should be conducted.

4. Conclusion

In terms of nursing theory, it has great significance in that it introduced a new concept known as situational awareness to the decision-making process of patients with coronary syndrome for the first time. As of now, there was little information available about the decision-making process since studies on the pursuit of treatment for patients with acute coronary syndromes have largely focused on examining the influencing factors or explanations based on motivational theories or health behavior theories. Ultimately, the prognosis and complications of acute coronary syndrome are determined by how quickly the patient decides to seek medical care after onset of symptoms, is admitted to the hospital, and is treated. Nursing theoretical significance can be found in the fact that a tool has been developed that can confirm the level of situational awareness about how to accurately recognize, interpret, and judge a situation to make the right decision to go to the hospital and receive treatment.

Finally, the limitations of the study are that it may be somewhat subjective because it is based on a retrospective questionnaire based on memory and recall, and there is no comparative study by applying the situational awareness tool to patients with acute coronary syndrome for the first time.

In that sense, the Korean version of the modified situational awareness tool is considered to be an appropriate tool for measuring situational awareness in patients with acute coronary syndrome, and repeated studies will be required.

REFERENCES

[1] W. Chen, S. L. Woods, D. J. Wilkie & K. A. Puntillo. (2005). Gender differences in symptom experiences of patients with acute coronary syndromes. *Journal of pain and symptom management, 30(6),* 553-562.
DOI : 10.1016/j.jpainsymman.2005.06.004

[2] G. De Luca, H. Suryapranata, J. P. Ottervanger & E. M. Antman. (2004). Time delay to treatment and mortality in primary angioplasty for acute myocardial infarction: every minute of delay counts. *Circulation, 109(10),* 1223-1225.
DOI :10.1161/01.CIR.0000121424.76486.20

[3] A. Alrawashdeh, Z. Nehme, B. Williams, K. Smith, M. Stephenson, S. Bernard & D. Stub. (2021). Factors influencing patient decision delay in activation of emergency medical services for suspected ST-elevation myocardial infarction. *European Journal of Cardiovascular Nursing, 20(3),* 243-251.
DOI : 10.1177/1474515120953737

[4] W. J. PENNY. (2001). Patient delay in calling for help: the weakest link in the chain of survival?. *Heart, 85(2),* 121-122.
DOI : 10.1136/heart.85.2.121

[5] R. Kaur, V. Lopez & D. R. Thompson. (2006). Factors influencing Hong Kong Chinese patients' decision-making in seeking early treatment for acute myocardial infarction. *Research in nursing & health, 29(6),* 636-646.
DOI : 10.1002/nur.20171

[6] S. Y. Hwang, C. Ryan, & J. J. Zerwic. (2006). The influence of age on acute myocardial infarction symptoms and patient delay in seeking treatment. *Progress in cardiovascular nursing, 21(1),* 20-27.

[7] S. M. Fox-Wasylyshyn, M. El-Masri & N. T. Artinian. (2010). Testing a model of delayed care-seeking for acute myocardial infarction. *Clinical nursing research, 19(1),* 38-54.
DOI : 10.1177/1054773809353163

[8] J. C. Walsh, M. Lynch, A. W. Murphy & K. Daly. (2004). Factors influencing the decision to seek treatment for symptoms of acute myocardial infarction: an evaluation of the Self-Regulatory Model of illness behaviour. *Journal of psychosomatic research, 56(1),* 67-73.
DOI : 10.1016/S0022-3999(03)00082-5

[9] G. Klein(2008). Naturalistic decision making. *Human factors, 50(3),* 456-460.
DOI : 10.1518/001872008X288385

[10] R. T. Nullmeyer, D. Stella, G. A. Montijo, G. A. & S. W. Harden. (2005). Human factors in Air Force flight mishaps: Implications for change. In Proceedings of the 27th Annual Interservice/Industry Training, Simulation, and Education Conference (No. 2260). Arlington, VA: National Training Systems Association.

[11] B. Watts. (2004). *Situation Awareness in Air-to-Air Combat and Friction. In Clausewitzian Friction and Future War.* Institute of National Strategic Studies, National Defense University.

[12] B. R. Brodie, T. D. Stuckey, D. B. Muncy, C. J. Hansen, T. C. Wall, M. Pulsipher & N. Gupta. (2003). Importance of time-to-reperfusion in patients with acute myocardial infarction with and without cardiogenic shock treated with primary percutaneous coronary intervention. *American heart journal, 145(4),* 708-715.
DOI : 10.1067/mhj.2003.9

[13] M. C. Wright, J. M. Taekman, & M. R. Endsley(2004). Objective measures of situation awareness in a simulated medical environment. *BMJ Quality & Safety*, 13(suppl 1), i65-i71.
DOI : 10.1136/qshc.2004.009951

[14] R. M. Taylor. (2017). Situational awareness rating technique (SART): The development of a tool for aircrew systems design. In Situational awareness (pp. 111-128). Routledge.

[15] J. C. Nunnally. *In: Psychometric theory*. 2nd ed. New York (NY): McGraw-Hill; 1978. pp. 330-430.

[16] M. D. Newcomb, C. P. Chou, P. M. Bentler & G. J. Huba. (1988). Cognitive motivations for drug use among adolescents: Longitudinal tests of gender differences and predictors of change in drug use. *Journal of Counseling Psychology, 35(4),* 426.

[17] G. S. Kim. (2011). *AMOS 18.0 Analysis structural equation modeling*. Seoul : Hannarae Publishing Co.; 2011.

[18] M. R. Endsley. (1995). Toward a theory of situation awareness in dynamic systems. *Human factors, 37(1),* 32-64.
DOI : 10.1518/001872095779049499

[19] S. H. Choi, Y. C. Y. H. Lee & J. D. Jeon(2009). A Study on the Effects of Helicopter Pilot's Working Career to Situation Awareness. *Journal of the Korean society for aeronautical and flight operation, 17(1),* 71-76.

[20] C. Henriksson, B. Lindahl & M. Larsson. (2007). Patients' and relatives' thoughts and actions during and after symptom presentation for an acute myocardial infarction. *European Journal of Cardiovascular Nursing, 6(4),* 280-286.
DOI : 10.1016/j.ejcnurse.2007.02.001

[21] J. R. Quinn. (2005). Delay in seeking care for symptoms of acute myocardial infarction: applying a theoretical model. *Research in nursing & health, 28(4),* 283-294.
DOI : 10.1002/nur.20086

[22 A. G. Rosenfeld. (2001). Women's risk of decision delay in acute myocardial infarction: implications for research and practice. *AACN Advanced Critical Care, 12(1),* 29-39.
DOI : 10.1097/00044067-200102000-00005

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