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Article

The Development and Effect of a Simulation Education Program Based on the Korean Triage and Acuity Scale (KTAS)

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Abstract: This study focused on the development and implementation of an educational simulation program based on Korean Triage and Acuity Scale (KTAS) for nurses in emergency medical centers who completed KTAS training. We also examined its educational effects based on the evaluation of clinical decision-making ability, job satisfaction, and customer orientation. The study participants were 30 nurses in the emergency medical center of a general hospital. Data were collected from May 3 to 24, 2017, and analyzed using SPSS 22.0. There was a significant difference in the mean scores in clinical decision-making ability, job satisfaction, and customer orientation before and after simulation education. In other words, emergency nurses who received KTAS-based simulation education program improved their clinical decision making ability, job satisfaction, and customer orientation. Based on the results of this study, it is expected that it can be used for KTAS education, and it was found that simulation-based education is a useful learning method for triage nurses in emergency medical center.

Keywords: KTAS; simulation; clinical decision-making ability; job satisfaction; customer orientation; nurse

1. Introduction

According to the emergency medical center statistics, emergency medical centers are being consistently used by more than 10 million people per year, except in 2015 with 10,343,983 due to the Middle East Respiratory Syndrome (MERS) outbreak, at 10,419,983 in 2014 and 10,186,341 in 2013 [1]. In addition, the use of emergency medical centers is increasing due to an increase in the number of disasters and accidents, and higher levels of service at emergency medical centers are being requested due to the improvements in the "quality of life" of people following medical technology development [2].

However, the reality is that most Korean emergency medical centers are used as waiting rooms for hospitalizations, because of which the phenomenon of work stagnation worsens and leads to the inability of the emergency medical center to provide satisfactory service to their visitors [3]. The increase in non-emergency patients also leads to inefficient management of medical resources, and therefore, the need for a severity classification system to determine and categorize the severity of patients for efficient management has been in the limelight [4]. Severity classification is a systematic classification of patients visiting the emergency medical center for assessing the severity of the health problem, making a judgment about the order of prioritization of care, performing emergency treatment, and allocating cases to appropriate departments [5]. Domestic emergency medical centers use the classification system of the Canadian Triage and Acuity Scale (CTAS), Australasian Triage Scale (ATS), Emergency Severity Index (ESI), or National Emergency Department Information System (NEDIS) as it is or use a modified severity classification tool [5]. However, the severity

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classification tool used in Korea is a system developed for other countries. Therefore, the use of these severity classification tools in Korea is difficult to apply it to the situation in Korea due to excessive billing of the severity classification emergency medical treatment that is commonly used in Korea, and the difficulty of applying it at the pre-hospital stage [5].

The lack of a standardized classification tool that fits Korea has been the cause of inefficient management of medical resources as well as overpopulation of the emergency medical center and has worked as a factor that decreases satisfaction with service for the admitted patients [1]. For this, the Korean Society of Emergency Medicine and Ministry of Health and Welfare have developed the Korean Triage and Acuity Scale (KTAS) based on the CTAS in 2012 and implemented it since January 2016 to construct an efficient emergency medical system and increase the satisfaction of admitted patients. Generally, a standardized severity classification tool can be expected to improve the satisfaction of admitted patients and increase job satisfaction of the nurses tasked with severity classification [3]. The improvement in the job satisfaction of nurses is also expected to improve their customer-oriented attitude, leading to an improvement in the hospital's image and customer satisfaction [6]. Job satisfaction refers to a favorable attitude toward the job, and customer orientation refers to assessing customer needs and aiming to improve customer satisfaction.

The severity classification at emergency medical centers in Korea is done mainly by nurses, whose decision making is very important because it has a significant impact on the patient's prognosis and treatment process [7]. Korean Society of Emergency Medicine conducts 8 hours of training for the standardized KTAS classification, but it is insufficient to demonstrate a quick and accurate response to patients who come to the emergency medical centers due to various and urgent conditions.

Simulation education is emerging as a method of learning based on reenactment of on-site situations that is equal to the clinical education in nursing [8]. Lectures and observational education have practical difficulties in fulfilling diverse nursing needs required at clinical sites and the ability to perform clinical nursing duties [9]. Moreover, simulation education, which is a safe way to train nurses is a very efficient training method at a time when public interest in medical knowledge is increasing [10].

There is not only a dearth of research related to the severity classification of emergency medical center nurses, but also simulation-based education techniques for it. There is a need for the continuation of development of simulation-based training programs for the improvement and training of skills for nurses [11]. Therefore, the purpose of this study is to develop a simulation education program based on KTAS and implement it to nurses in emergency medical centers to assess its impact, and provide basic data to develop systematic KTAS education programs later.

2. Materials and Methods

2.1. Design

To develop a KTAS-based simulation training program for emergency medical center nurses, our study was conducted in five steps—analysis, design, development, implementation, and evaluation—based on the ADDIE model, which is a representative model of instructional system design [12]. The development process for the simulation-based Korean severity classification training program using standardized patients is as shown in Figure 1.

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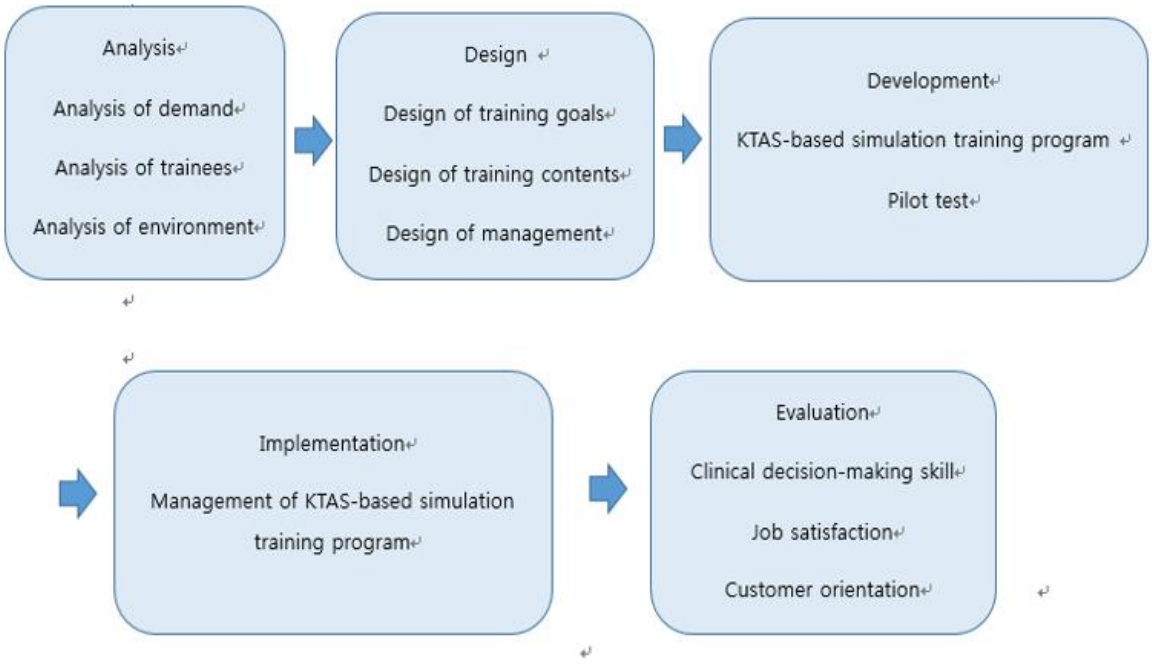

Figure 1. Development of a KTAS-based stimulation training program

2.2. Participants

The participants of this research were emergency medical center nurses who completed the KTAS training, understood the purpose and contents of this research, and voluntarily participated. A sample of 30 nurses was recruited based on the minimum sample size of 27, which was calculated with effect size 0.50, significance level 0.50, and power 0.80 using the G-power 3.1.9 for windows program, and a 10% drop-out rate.

2.3. Data collection

Data were collected from May 3 to 24, 2017. After receiving approval and cooperation from the hospital, the surveys were distributed to emergency medical center nurses. Data were collected before and after the implementation of the simulation education program developed in our study.

2.4. Instruments

2.4.1. Clinical decision-making ability

To measure clinical decision-making ability, a tool developed by Jenkins [13] and revised by Baek [14] was used in our study. The tool consists of a total of 40 items and comprises four sub-domain. Each domain consists of 10 questions. A higher score indicates a higher clinical decision-making ability. Reliability at the time of development was Cronbach' α=.82, and reliability in our research was Cronbach' α=.86.

2.4.2. Job satisfaction

To measure job satisfaction, the tool revised iby Lee in 2010 [15] was used in our study. The tool consists of a total of 12 items. A higher score indicates higher job satisfaction. Reliability in the original study was Cronbach's α=.86, and reliability in our study was Cronbach's α=.88.

2.4.3. Customer orientation

To measure customer orientation, the tool developed by Saxe and Weitz [16] was used. There are a total of 6 items. Higher score indicates higher customer orientation. In a previous study, the

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reliability of the scale was found to be Cronbach's α=.90[17], and reliability in our study was Cronbach's α=.89.

2.5. Data analysis

Collected data were analyzed using IBM SPSS Statistics for Windows, Version 22.0. General characteristics and comparison of key variables before and after program participation were analyzed using mean comparison. Clinical decision-making ability, job satisfaction, and customer orientation were analyzed by paired and t-tests.

2.6. Ethical considerations

This study was conducted after being reviewed and approved from the institutional bioethics committee at the institution in which the researcher works (IRB File No: NHIMC 2016-12-008-001). The purpose and methods of this research were explained to the participants; only those who gave written informed consent were selected for the study. It was explained to them that they can terminate their participation at any time during the study and that there would be no disadvantages due to the termination.

3. Results

3.1. Development of the simulation education program based on KTAS

The simulation-based KTAS education program in this study was conducted in five stages: analysis, design, development, implementation, and evaluation, based on the ADDIE model [12].

3.1.1. Analysis

In order to select the educational topic of this program, it was selected as the assessment of heart disease patients complaining with digestive symptoms shown in the needs survey.

3.1.2. Design

The educational objective of the program was quickly and accurately classify the severity, then assess the patients followed by therapeutic communication with the patient. The simulation program was conducted with pre-debriefing, scenario operation with standardized patients, and debriefing. To evaluate the effect of developing a simulation education program based on the KTAS, it was designed as shown in (Figure 2).

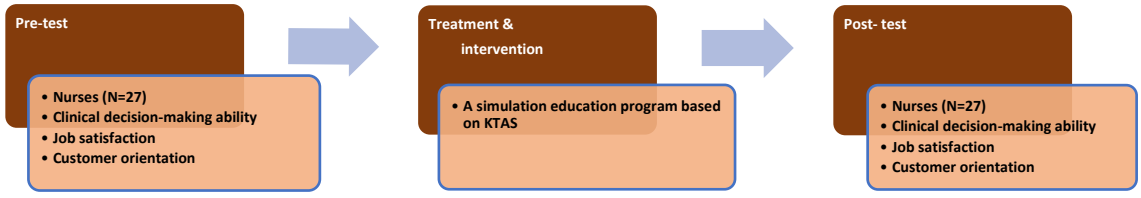

Figure 2. Evaluation of a simulation education program based on KTAS.

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3.1.3. Development

To develop the scenario, the KTAS manual was used. In the case of a patient, an adult male visited the emergency room due to sudden abdominal pain, and said that it was a pain in a different location than before, but as a result of the classification, medical treatment was not required immediately, so he was asked to wait in the patient waiting room. This case was designed to quickly and accurately classify patients based on the KTAS, and to assess patients according to the patient's chief complaint through therapeutic communication. The contents of the scenario were standardized by one emergency medicine specialist, two clinical nurses with experience of more than 10 years in the emergency medical center, and one instructor of the KTAS. After the pilot test, the scenario and the problems of the evaluation checklist were revised and supplemented, and the scenario was finally confirmed.

3.1.4. Implementation

From May 3 to 24, 2017, a total of 5 scenarios were run for 40 minutes each. Four to six nurses were grouped together, and each person took 10 minutes for pre-debriefing, 10 minutes for scenario operation, and 20 minutes for debriefing. The total simulation operation time was 40 minutes.

3.1.5. Evaluation

Clinical decision-making ability, job satisfaction, and customer orientation were evaluated to check the effectiveness of the simulation education program based on KTAS.

3.2. Effect of simulation education program based on KTAS

3.2.1. General characteristics of participants

After excluding 3 inappropriate surveys out of 30 participants, the final sample consisted of 27 emergency medical center nurses. Of the 27, 14 (51.9%) participants were in their 20s and the average age was 33 years old. By gender, females comprised the majority at 24 subjects (88.9%), and the rest were males (11.1%). For clinical experience, we used the model developed based on the Dreyfus model of skill acquisition that was further revised to fit the Korean clinical environment. In terms of total clinical experience, 14 subjects (51.8%) were considered “competent” and there was no one in the novice stage. By work experience in emergency medical centers, 14 subjects (51.8%) had 4–6 years of experience and the average experience in emergency medical centers was 71.3 months.

3.2.2. Effectiveness of the simulation education program

The effect of KTAS-based simulation education on clinical decision-making ability is listed in Table 1. Regarding clinical decision-making ability, “review of goals and values” showed the largest effect, while “search information and synchronize by connecting with new information” showed the smallest effect.

Table 1. Effectiveness of the Simulation Education Program: Clinical decision-making ability

Item	Before participation M±SD	After participation M±SD	t	p
Clinical decision-making ability	2.66±.25	3.95±.36	-27.19	.000

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"Evaluate and re-evaluate the conclusion"	2.69±.24	3.93±.30	-15.40	.000
"Review of goals and values"	2.59±.32	4.06±.31	-21.33	.000
"Search information and synchronize by connecting with new information"	2.70±.23	3.95±.29	-19.26	.000
"Investigate about the choice and the alternative"	2.66±.23	3.92±.24	-18.08	.000

$p < 0.05$

A total of 12 items in the job satisfaction showed a significant difference (Table 2). "My hospital has many opportunities for promotion" showed the largest effect, while "Considering the above, I am satisfied with my current job" showed the smallest effect.

Table 2. Effectiveness of the Simulation Education Program: Job satisfaction

	Before participation M±SD	After participation M±SD	t	p
Job satisfaction	2.65±.56	3.86±47	-16.27	.000
I can work independently.	2.89±.89	3.81±.56	-4.65	.000
There are many opportunities for me to be recognized for my ability.	2.59±1.01	3.92±.61	-6.45	.000
I can share with my superiors any dissatisfaction or grievances about my duties.	2.81±.96	4.19±.79	-6.60	.000
I feel sufficiently rewarded and fulfilled by my job.	2.59±1.05	3.89±.80	-4.69	.000
My salary is at a satisfactory level.	2.93±1.04	4.04±.75	-4.22	.000
I am receiving a fair reward for my work.	2.74±.81	3.82±.73	-5.82	.000
The amount of work I do is adequate.	2.44±1.01	3.63±.79	-4.53	.000
My hospital has a good welfare system.	2.48±1.22	3.85±.77	-5.87	.000
The conditions necessary for performing my duties are well established.	2.52±1.12	3.96±.71	-5.18	.000
My hospital has many opportunities for promotion.	2.41±.64	3.81±.83	-6.98	.000
There is effective personnel management at my hospital.	2.67±.97	3.74±.59	-5.60	.000

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Considering the above, I am satisfied with my current job.	2.74±1.26	3.74±.90	-3.08	.005

$p < 0.05$

A total of 6 items in the customer orientation tool showed a significant difference (Table 3). "I try to pay attention to the opinions of my customers" showed the largest effect, while "I try to understand what the customer wants" showed the smallest effect.

Table 3. Effectiveness of the Simulation Education Program: Customer Orientation

Item	Before participation M±SD	After participation M±SD	t	p
Customer Orientation	2.67±.34	3.88±.69	-11.44	.000
I respond well to customer questions.	2.74±.67	3.85±.86	-6.18	.000
I am kind to my customers.	2.56±.89	3.85±.77	-5.60	.000
I try to understand what the customer wants.	2.74±1.06	3.81±.74	-5.04	.000
I try to help the customer.	2.52±.89	3.81±.96	-5.75	.000
I try to pay attention to the opinions of my customers.	2.78±.75	4.00±.73	-7.50	.000
I am truly interested in the customer.	2.67±.92	3.96±.65	-5.75	.000

$p < 0.05$

4. Discussion

4.1. Development of the KTAS-based simulation education program

In this study, needs were analyzed through interviews targeting nurses who were KTAS graduates. As a result, they said that it was difficult to classify patients with high risk, determine the range of treatment for trauma patients, assess pain and discomfort in children, and classify patients with heart disease complaining of gastrointestinal symptoms. This is in line with research by Kim, Kim, and Park [18] on the training demands of intensive care unit nurses, research by Han [19] on the training demands of university hospital nurses for clinical skills training, and analysis of demands by Kim and Kang [11] in their research on the development and assessment of effectiveness of simulation program for novice nurses in specialized units (emergency room and intensive care unit). Therefore, prior research shows that the training demands of nurses who work for emergency medical centers are higher for specialized clinical skills and knowledge than general nursing knowledge.

Lecture education is effective for knowledge transfer, but there are limitations in improving nursing clinical skills [20]. Therefore, our study aimed to develop a simulation-based training program to actualize continuous learning in an environment similar to clinical settings.

A scenario was developed for classification of heart disease patients who report digestive symptoms, reflecting the previous training demands. This was intended to develop a scenario to diagnose and classify diseases rather than direct intervention such as cardiopulmonary resuscitation-related scenarios and circulatory diseases used in prior studies [21-23]. The developed simulation learning program helped with quick and accurate decision making when classifying severity using KTAS.

Although simulation training programs for nurses have been developed in Korea, most were related to infection control training [24], basic life support, or advanced cardiac life support [21-23,25]. Although our study is similar to the study by Baek [22] on the effect of simulation-based training on professional heart resuscitation performance of nurses in intensive care and emergency rooms, and study by Hyun [23] on the effect of simulation training on the nursing officers' confidence with performing advanced cardiac life support, in which simulation-based training was conducted on clinical nurses, our study is significant in that it provided simulation training for severity classification to those who completed KTAS.

Recently, there have been active studies on simulation-based learning among different professions. Stocker, Allen, Pool, De Costa, Combes, West, and Burmester [26] found an increase in crisis management ability of surgeons, cardiologists, anesthesiologists, and nurses in pediatric intensive care units via simulation-based training. Colacchio, Johnston, Zigmont, Kappus, and Sudikoff [27] found improvements in teamwork after implementing simulation-based training to medical professionals working in neonatal intensive care units. As emergency medical centers are a place where people from a variety of fields work together, it is necessary to reenact complex clinical scenarios to increase the effectiveness of simulation-based education and conduct research on the use of simulation in various fields.

4.2. Effectiveness of the KTAS-based Simulation education Program

The second objective of the study was to test the effectiveness of the simulation-based nursing training program by assessing the clinical decision-making ability, job satisfaction, and customer orientation of nurses before and after participation in the stimulation-based nursing training program. The results are discussed based on three perspectives.

First, examining the effectiveness after implementing the KTAS-based simulation education program showed an effect in the clinical decision-making ability, in that, this ability significantly improved. Although this is difficult to compare with previous studies given the lack of research on clinical decision making of emergency medical center nurses in the context of simulation training, this is in line with results from a study by Kim and Park [28] on the development and effectiveness of simulation training program for novice nurses in special units (emergency room & critical care unit), and a study by Maxson, Dozois, Holubar, Wrobleski, Dube, Klipfel, and Arnold[29] which found improved clinical decision-making ability by a multidisciplinary implementation of simulation-based training. Furthermore, studies on the clinical decision-making ability [14,28,30-31] also reported a significant effect of job satisfaction, critical thinking disposition, and autonomy on clinical decision-making ability. This is similar to our results and the opportunity to learn decision making through repeated training and on-site reenactment learning in a safe environment may have led to improved clinical decision making. Implementing simulation-based education by reenacting similar clinical situations may be especially useful to new nurses who lack clinical decision-making ability and clinical skills and may help improve their clinical decision-making ability.

Second, results of examining the effect after implementing the KTAS-based simulation education program showed a significant increase in job satisfaction, signaling that simulation had an effect. This is similar to the results of the research by Cheng, Donoghue, Gilfoyle, and Eppich [32] on various medical professionals which found increased satisfaction in simulation training for pediatric

emergency situations. The increase in job satisfaction in our study may have increased because of an increase in self-confidence due to simulation training in a safe environment that is similar to a clinical situation Based on this, if education and training using simulations to improve the satisfaction of health professionals, it will help improve the satisfaction of medical staff. In addition, it is thought that a follow-up study related to this is necessary.

Third, results of examining the effect after implementing the KTAS-based simulation training program showed a significant increase in customer orientation, showing that simulation training program is effective in increasing customer orientation. This is in line with a study on the effect of perception of inter-marketing, empowerment, and job satisfaction of hospital nurses on customer orientation [33], a study on the effect of customer orientation, emotional labor, exchange relation, and close ties on the willingness to change jobs in hospital nurses [34], and a study on the effect that specialty professionalism of specialized hospital nurses has on job satisfaction, customer orientation, and quality of service [35] which have found increased customer orientation associated with higher job satisfaction, lower willingness to change jobs, and more active inter-marketing.

Despite the increase in the demand for high quality services in emergency medical centers, satisfaction rating among emergency room visitors is low at 42.1%, with “emergency medical costs” and “wait time” influencing dissatisfaction. Kindness toward medical staff (doctors, nurses), it was found that patients who visited the emergency room felt that the quality of service was low compared to the cost [1]. Based on this, improvements in the nurses’ job satisfaction leads to improved customer orientation, which further leads to an enhancement in the image of the hospital. Thus, the customer orientation improvement seen in our study is a significant result in the improvement of satisfaction for inpatient and outpatient visitors. Furthermore, in the medical setting in which the demand for customer service is increasing, the improvement of customer orientation in this study is considered to be a research that meets the public anticipation for future emergency medical centers.

Overall, our study found that the KTAS-based simulation education program had a positive effect on the nurses’ clinical decision-making ability, job satisfaction, and customer orientation. Therefore, simulation-based nursing programs using standardized patients must be developed for various clinical skills and emergency treatments in the emergency medical centers. Moreover, using simulations for KTAS for providing education can lead to a more realistic training, and the resulting ability to quickly and accurately classify severity can have a positive effect in the prognosis and satisfaction of the patients.

The study also has certain limitations. We did not study as to what might happen in highly crowded emergency medical centers. Future studies should construct a scenario related to overpopulation in the emergency medical center that requires a quick decision from the severity classifier, such as when an emergency patient and a non-emergency patient are admitted simultaneously in the emergency medical center.

5. Conclusions

To determine the efficacy of simulation-based education, it is necessary to put them into practice. This study confirmed that the KTAS-based simulation education program developed for emergency medical center nurses is effective in improving their clinical decision-making ability, job satisfaction, and customer orientation. The results of this study have provided evidence for the application of simulation-based education that could be applied in the clinical field, deviating from the traditional education method. In addition, it was found that it is an educational method that is helpful in improving the professionalism of nurses.

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