Advanced Science and Technology Letters
Vol.120 (GST 2015), pp.39-44
http://dx.doi.org/10.14257/astl.2015.120.07

Effects of Repeated Simulation-Exposure on Hospital Emergency Care

Eun Hee Choi[1] and Eun Hwi Kim[2]

[1] School of Nursing, Yeungnam University College, 170, Hyunchug-ro, Namgu, Daegu, Korea, eh5472@ync.ac.kr
[2] College of Nursing, Kyungwoon University, 730, Gangdong-ro, Sandong-myeon, Gumi, Gyeongbuk, 39160, Korea, pepe0508@hanmail.net

Abstract. This study was conducted to verify effects of repeated simulation-exposure by the role on hospital emergency care. A non-equivalent control group design was used in this study. 144 nursing students had 6 time simulation-based educations. The experimental group (n=65) had leader experiences but the control group (n=79) didn't have. Satisfaction, self-evaluation and performance were measured to compare the differences between the two groups. Data were analyzed by mean, standard deviation, two sample t-test and two way repeated measured ANOVA. Satisfaction (t=0.257, p=.798), self-evaluation (t=-1.650, p=.102), and performance (t=0.147, p=.883) scores between the groups were not significantly different after the educations. Performance scores were significantly increased by the number of the simulation-exposure (F=412.724, p<.001), but not significantly different by the leader experience (F=1.246, p=.266). This study would support that repeated simulation-exposures improved the performance level on hospital emergency care regardless of role of simulation settings.

Keywords: Repeated exposure, Simulation, Emergency

1 Introduction

Simulation-based learning has being risen as an alternative educational method in nursing education because of more complex and higher level needs in the current clinical nursing practice and environmental changes of the clinical practicum. Many trails have been conducted to verify the effect of the simulation-based learning [1-3]. Previous studies suggest that simulation-based learning improve satisfaction, knowledge, psychomotor skill, critical thinking, problem solving, and communication [4]. Furthermore most of simulation studies have been concentrated upon investigating effects depending on simulation-fidelity [5] and curriculum [6].

Specific operation methods of simulation-based education, such as role assignment and numbers of the simulation-exposures, are currently emerging factors to be considered to increase the efficiency of the simulation-based education. Traditionally simulation-based educations are composed of student's simulation experience and debriefing. But people can also learn with observing others' practice. They watch,

ISSN: 2287-1233 ASTL

understand and organize their actions through the observational learning and can increase even their psychomotor skill [7].

Nurses are often faced with emergency situations in hospitals and the nursing competency for hospital emergency care is essential. Usually they learn to how to act as an emergency team in the simulation-based education for hospital emergency care. In these situations, many nursing students are hard to get the opportunity as a leader but they frequently get experiences as an observer or any other roles. Recent studies suggest that repeated simulation-exposures seem to be effective to enhance the performance level [8, 9]. At this point, it is needed to evaluate effects of the repeated-simulation exposures depending on the role for hospital emergency care.

Additionally, several studies show that the simulation-based education is effective to increase emergency care competencies such as cardiac life supports [5, 10] but the result is not consistent. Therefore this study was planned to verify effects of the simulation-based education on hospital emergency care with considering the number of the simulation-exposures and the role to play in the simulation team.

The aim of this study was to investigate effects of repeated simulation-exposure and differences of the effects by role to play in the team-based simulation education on hospital emergency care.

2 Materials and methods

This is the comparative study intended to find out the effects of repeated simulation-exposure depending on having leader experience on hospital emergency setting. All subjects who took part in this study were nursing students as had previously submitted written consent.

2.1. Sample and Instrument of Data Collection

The convenience sample for this study consisted of 144 nursing students attending a baccalaureate undergraduate program at a college in the Republic of Korean. Situational performance evaluation scale by educator and themselves was items consisted with more than content validity index 0.8 [11]. It was developed by researcher and 3 members of coworkers had more than 5yrs career as an educator and nurse.

2.2. Process

Experimental group experienced roles as a leader and control group didn't know which group was experiment or control group. They just knew to take part in simulation practice about emergency care in the hospital and listen to the process of simulation practice. The evaluation of simulation was done in the control room where nursing students didn't know what was evaluated. Simulation practice was done six-times by group.

3 Results

3.1. Homogeneity test for characteristics between groups

There were no significant differences in age, academic achievement, problem solving, critical thinking, and clinical competency at baseline between experimental and control group.

Table 1. Homogeneity for characteristics between groups (N-144)

Characteristic	Con (n=79) M±SD	Exp (n=65) M±SD	t	*p*
Age (year)	22.60 ± 2.18	22.63 ± 1.88	0.067	.946
Academic achievement	2.64 ± 0.66	2.50 ± 0.75	-1.170	.244
Problem solving	3.59 ± 0.34	3.65 ± 0.42	0.866	.388
Critical thinking	2.81 ± 0.24	2.84 ± 0.31	0.602	.548
Clinical competency	3.04 ± 0.24	3.02 ± 0.27	-0.601	.549

Con, control group; Exp, Experimental group; M, mean; SD, standard deviation; *p*, *p*-value

3.2. Comparison for satisfaction, self-evaluation, and performance scores after the repeated simulation-exposures

There were no significant differences in educational satisfaction (t=0.257, *p*=.798) and self-evaluation(t=-1.650, *p*=.102) between groups. Performance scores after 1st, 3rd and 6th simulation-exposure were increased continuously in both groups. There were no significant differences in performance scores after 1st and 6th simulation-exposure between groups (respectively t=0.915, *p*=.362; t=0.147, *p*=.883). Only those after 3rd simulation-exposure were significantly different (t=-3.363, *p*<.001).

Table 2. Satisfaction, self-evaluation and performance after repeated simulation-exposure (N=144)

Variable	Con (n=79) M±SD	Exp (n=65) M±SD	t	*p*
Satisfaction	1.67 ± 0.49	1.69 ± 0.49	0.257	.798
Self-evaluation	22.18 ± 1.79	21.56 ± 2.56	-1.650	.102
Performance score after 1st exposure	7.89 ± 3.81	8.63 ± 5.44	0.915	.362
Performance score after 3rd exposure	15.51 ± 3.91	13.03 ± 4.79	-3.363	.001
Performance score after 6th exposure	19.32 ± 2.70	19.40 ± 3.08	0.147	.883

Con, control group; Exp, Experimental group; M, mean; SD, standard deviation; *p*, *p*-value

3.3. Difference of performance change between groups

Performance scores of two groups were significantly changed by simulation-exposure number (F=412.724, p<.001), interactions by simulation-exposure number and group (F=9.668, p<.001), but not significantly different by group(F=1.246, p=.266).

Table 3. Difference of performance change (N=144)

Variable	Source of variance	d.f.	F	p
Performance score	Groups (Con-Exp)	1	1.246	.266
	Time	2	412.724	<.001
	Group × Time	2	9.668	<.001

Con, control group; Exp, Experimental group; Time, Performance Score after 1st, 3rd, and 6th simulation-exposure; p, p-value

4 Discussion

The present study investigated the effects of repeated simulation-exposures and differences of the effects by participants' role in the team-based simulation education on hospital emergency care.

The performance scores were significantly increased by the simulation-exposures on hospital emergency care. As this result, many previous studies indicate that simulation-based education increases performance skill on emergency care [9, 12, 13]. But most of simulation studies examine only effect just after simulation-based education [1, 14, 15] and don't ascertain the variation by the repeated simulation-exposures. As similar to this study, some studies verify that the repeated simulation-exposures increase not only technical skill [9, 12] but also teamwork and satisfaction [12]. But the effects of the repeated simulation-exposures couldn't be extended to increase the performance in other situation-simulations [9], even though it is verified that simulation-based educations are effective to increase critical thinking, problem solving and decision-making in a systematic review [4]. A study to investigate the effect of the repeated simulation-exposure on non-technical skill, like team working, task management and decision making, shows the repeated exposure don't significantly increase the non-technical skill after one exposure [16]. Therefore the repeated-simulation educations seems to be an effective method to increase the performance skills, but effects of other core nursing competencies and the extension possibility in other clinical situations have to be examined furthermore.

Secondly, this study investigated whether having leader experience influenced on the effects of simulation-base education. In this study, there were no significant differences on educational satisfaction, self-evaluation, and performances scores depending on having leader experience. Both, which having leader experience as well as not having, increased performance score continuously by the number of simulation

exposure. It indicates that people can conduct successfully even complex psychomotor skills with a series of observing, understanding, and reconstructing process inside of themselves. Actually observational learning is also effective to the complex medical procedure such as anesthesia training [7]. This result can be applied to plan simulation-based education with restricted sources and increase the effectiveness of the education with repetition. But more related studies in other situations or participants are needed to conclude it.

Finally, this study verified that the performance scores were significantly improved by the number of the simulation-exposure rather than having leader experiences. Previous studies indicate that repeated simulation-exposures improve performance skills [8, 9, 12] and observational learning is also effective to train psychomotor skill [7, 17]. It means the key element to enhance performance level in simulation-education is not playing role but number of simulation-exposure.

5 Conclusions

This study is a non-equivalent quasi-experimental design to examine effects of repeated simulation-exposure depending on having leader experience on hospital emergency care. This study suggested that the number of simulation-exposure is essential to improve the performance level on hospital emergency care regardless of role of simulation settings.

This result could be applied to plan simulation-based education on hospital emergency care. It seems to increase effects of the simulation-based learning and be useful to organize the simulation-based learning more efficiently. In conclusion, this study suggests that the number of simulation-exposure has to be considered first of all and role to play in simulation-setting can be supplemented with observational learning.

6 Conflict of interest and acknowledgment

No potential conflict of interest relevant to this article was reported.

References

1. Yoou, S. K,. Kwon, H. J.: Study about the satisfaction with simulation practice course experience on ACLS of paramedic students. J Korea Acad Industr Coop Soc. 16(10), 6647-6654 (2015)
2. Roh, Y. S., Kim, S. H., Yang, S. H., Kang, Y. S.: Clinical competence and self-confidence of new graduate nurses with an integrated nursing curriculum of simulation with problem-based learning. J Korea Acad Industr Coop Soc.14(7), 3349-3357 (2013)
3. Chae. M. O.: Effects of a simulation-based program on self-directed learning ability, metacognition and clinical competence in a nursing student. J Korea Acad Industr Coop Soc. 16(10), 6832-6838 (2015)

4. Lim, K. C.: Directions of simulation-based learning in nursing practice education: a systematic review. J Korean Acad Soc Nurs Edu. 17(2), 246-256 (2011),
5. Kim, Y. H. and Jang, K. S.: Effect of a simulation-based education on cardio-pulmonary emergency care knowledge, clinical performance ability and problem solving process in new nurses. J Korean Acad Nurs. 41(2), 245-255 (2011)
6. Barsuk, J. H., Cohen, E. R., Wayne, D. B., Siddall, V. J., McGaghie, W. C.: Developing a simulation-based mastery learning curriculum: lessons from 11 years of advanced cardiac life support. Simul Healthc. (2015). Epub 2015/11/05. doi: 10.1097/sih.0000000000000120.
7. Cordovani, L.and Cordovani, D.: A literature review on observational learning for medical motor skills and anesthesia teaching. Adv Health Sci Educ Theory Pract. (2015). Epub 2015/10/29. doi: 10.1007/s10459-015-9646-5.
8. Ortner, C. M., Richebe, P., Bollag, L. A., Ross, B. K., Landau, R.: Repeated simulation-based training for performing general anesthesia for emergency cesarean delivery: long-term retention and recurring mistakes. Int J Obste Anesth. 23(4), 341-347 (2014) Epub 2014/07/30. doi: 10.1016/j.ijoa.2014.04.008.
9. Tofil, N. M., Peterson, D.T., Wheeler, J. T., Youngblood, A., Zinkan, J. L., Lara, D., Jakaitis, B., Niebauer, J., White, M. L.: Repeated versus varied case selection in pediatric resident simulation. J Grad Med Educ. 6(2), 275-279 (2014) Epub 2014/06/21. doi: 10.4300/jgme-d-13-00099.1.
10. H. Y. Pee.: Effect of simulation-based practice program on ACLS study of paramedic students. Korean J. Emerg Med Serv. 17(3), 139-147 (2013)
11. Lee, E. O., Lim, N. Y., Park, H. A., Lee, I. S., Kim, J. I., Bae, J. I., Lee. S. M.: Nursing Research and statistic analysis, Soomoonsa Publisher, Seoul (2009)
12. Abe, Y., Kawahara, C., Yamashina, A., Tsuboi. R.: Repeated scenario simulation to improve competency in critical care: a new approach for nursing education. Am J Crit Care. 22(1), 33-40 (2013) Epub 2013/01/04. doi: 10.4037/ajcc2013229.
13. Ryoo, E. N., Ha, E. H., Cho. J. Y.: Comparison of learning effects using high-fidelity and multi-mode simulation: an application of emergency care for a patient with cardiac arrest. J Korean Acad Nurs. 43(2), 185-193 (2013) Epub 2013/05/25. doi: 10.4040/jkan.2013.43.2.185.
14. Shin, S. H., Kwon, M. S., Kwon, S. N.: Effects of a simulation-based training for advanced cardiovascular life support on the knowledge and competence for nursing students. J Korea Acad Industr Coop Soc. 14(11), 5819-5826 (2013)
15. Han, S. Y.: Effects of high-fidelity simulation-based education on nursing care for patients with acute chest pain. J Korea Acad Industr Coop Soc. 15(3), 1515-1521 (2014)
16. Yee, B., Naik, V. N., Joo, H. S., Savoldelli, G. L., Chung, D. Y., Houston, P. L., Karatzoglou, B. J., Hamstra, S. J.: Nontechnical skills in anesthesia crisis management with repeated exposure to simulation-based education. Anesthesiology. 103(2), 241-248 (2005)
17. Snyder, C. W., Vandromme, M. J., Tyra, S. L., Porterfield, J. R., Clements, R. H., Hawn, M. T.: Effects of virtual reality simulator training method and observational learning on surgical performance. World J Surg. 35(2), 245-252 (2011) Epub 2010/11/19. doi: 10.1007/s00268-010-0861-1.

