Evaluation of Simulation Based Education Clinical Preparation Program for Unstable Patient Management

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ABSTRACT [1]

In this study, the aim is to evaluate clinical transfer of unstable patient management competencies acquired by learners in simulated environment and evolution of their skills in clinical environment. Performances of 87 intern medical students of Acıbadem Mehmet Ali Aydinlar University that participated in two weeks long simulation based education program were evaluated both in simulated environment and in real clinical environment. Analyzes were performed using the MedCalc Statistical Software version 12.7.7. Observational performance scores of Group A were 18,68±1,70 over 24 point in simulated environment and 19,65±2,87 in first clinical test and 22,12±2,45 in second clinical test. Scores of Group C were 18,9±4,55 in simulated environment 16,36±4,2 in first clinical test, and 23,32±2,44 in second clinical test. Scores of Group D were 14,5±4,04 in simulated environment 19,32±3,76 in first clinical test and 21,87±2,78 in second clinical test. Scores of Group B in simulated environment were 17,68±2,73 but Group B performances could not be evaluated in clinical environment due to pandemic. Simulation-based education is effective for improving the competencies of learners for management of unstable patients.

Key words: Simulation based education, unstable patient management, and clinical transition program.

1. INTRODUCTION

Critical patient management is one of the most stressful situations for the healthcare providers [1,2,3]. The area where students feel most unprepared is critical patient management [4,5]. For this reason, courses, training modules have been applied and outcomes have been evaluated in many studies to provide these competencies [6, 7, 8]. Simulation based education (SBE) courses and programs have been found to be beneficial for preparing future physicians for emergency conditions [9,10,11, 12]. In our country, preclinical period of medical schools' educational methods mostly focus on computer-based or written documents. Therefore, the educational opportunity for solving complex real life problems is missing. In order to prepare students for critical patient management, two weeks long SBE Clinical Preparation Program has been developed.

The research purpose is to evaluate the effectiveness of the SBE clinical preparation program carried out in the simulation center of our university.

2. METHOD

Research Type and Research Design
In this prospective cohort study, the participants consisted of 87 interns studying at Acibadem Mehmet Ali Aydinlar University Faculty of Medicine in the 2019-2020 Academic Year. After getting approval of Institutional Ethical Committee and taking written

consent from all participants, the interns were included without any exclusion criteria. The learners weredivided into four groups in accordance with the internship groups. Group A consisted of 20, Group B 19, Group C 24 and Group D 24 participants. Intern doctors attended the SBE (Simulation based education)-Clinic Preparation Training Program, which lasted a total of 10 days before starting emergency medicine internship. The aim of this training program was to prepare interns for the clinic on potential life threatening conditions (PLTC) such as: altered mental status, shortness of breath, chest pain, multi-trauma, cardiopulmonary resuscitation and acute abdominal pain. The program was carried out in Acibadem Mehmet Ali Aydinlar University CASE (Center of advanced simulation and education) Simulation Center, which includes real medical equipment and advanced patient simulators. Evaluation of learners' performances on management of critical patients in real clinical environment was carried out at Atakent Hospital of Acibadem University.

SBE Clinical Preparation Program and Emergency Medicine Internship Program

The program aims to enable learners to evaluate the patient in accordance with the algorithms of critical patient management and make the necessary first intervention. In accordance with the schedule of each day and in line with the session outcomes, after 40 minutes of theoretical training, a two-hour interventional skills session followed by 4-hour simulation scenarios and reflection sessions were held. Each scenario took 15-20 minutes to complete, followed by the reflection / debriefing session 35-40 minutes. At the end of the training program each student performance is assessed by two assessors (faculty members experienced on SBE) unstable patient scenarios in the simulated environment.
Intern students' clinical performance analyses were done in university hospital. Each student's performance is assessed by two assessors on the bed-site when a critical patient arrived to emergency department and the first assessment was done. Clinical performances are evaluated both during the first and last week of emergency medicine internship.

Research Questions

1- Could the learners reach defined competencies for critical patient management in the simulated environment?
The technical skills such as ABCDE (airway, breathing, circulation, disability, exposure) management were evaluated by using ABCDE approach checklist

2- Have the defined competencies in critical patient management transferred to the clinical setting and developed?
During the first week, the educators evaluated critical bedside performance of the learners in the emergency department.
During the last week of the Emergency Medicine

Internship, learners' performances at the critical bedside with the ABCDE checklist were evaluated again.

Processing and Analysis of Data

The compliance of continuous variables to normal distribution was analyzed using the Shapiro Wilk test. Descriptive statistics (mean, standard deviation, minimum, median, maximum) were used to define continuous variables. The change between dependent and non-normally distributed continuous variables were examined using Friedman test, The change between two continuous variables suitable for dependent and normal distribution was examined with the t-test in paired samples, and the relationship between the dependent and two continuous variables not suitable for normal distribution was examined with the "Wilcoxon Signed Rank" test. The comparison of two independent and normally distributed continuous variables was made with Student's t test, and the comparison of two variables that were independent and not compatible with normal distribution was performed with the Mann Whitney U test. Statistical significance level was set at 0.05. Analyzes were performed using the MedCalc Statistical Software version 12.7.7 (MedCalc Software, Ostend,Belgium; http://www.medcalc.org; 2013).

3. RESULTS

87 interns who started the internship training period at Acıbadem Mehmet Ali Aydınlar University in the 2019-2020 academic year participated in the study. Learners did not attend any kind of unstable patient management training before this preparation program so none of them has prior experience on the management of critical patients.

Assessors of the simulated environment were two SBE experienced faculty members of university who are responsible for simulation based preparation program. Inter-rater correlation was found as 0.79. Assessors of clinical performance were two experienced faculty emergency physicians who are responsible for both running the emergency department in university hospital and training intern students. Inter-rater correlation was found as 0.82.

The Simulation-Based Training Program Outcomes of Intern Students on Critical Patient Management

In the context of the first research problem, technical competencies for critical patient management were evaluated. On the 10th day of the SBE program, the learning outcomes were evaluated using the unstable patient management checklist via simulated patient scenarios in simulated environment.

As seen in Table 1, the test scores out of a total of 24 points were 18.68 ± 1.70 in Group A, 17.68 ± 2.73 in Group B, 18.9 ± 4.55 in Group C, and 14.5 ± 4.04 in

Group D. The scores over 14.4 (%60) is defined as successful.

These scores show that although the scores are higher in some groups, each group has achieved the targeted level with the SBE program. A statistically significant difference was found between the scores of the groups in the analyzes (Kruskal Wallis, p <0.001)

Table1: Comparison of performance scores of the groups evaluated in simulated environment with the Kruskal Wallis test

	Performance scores				Kruskal Wallis Test		
	Mean	SS	Median	Min-Max	Chi-Square	df	p
Group A	18,68	1,70	19,0	16-23	18.125	3	**<0.001**
Group B	17,68	2,73	18,0	12-23			
Group C	18,90	4,55	19,5	8-24			
Group D	14,50	4,04	14,5	7-22			

Table 2: Distribution of performance evaluation results by groups

	Groups and Performance Scores				
	Group A	Group B	Group C	Group D	Kruskal Wallis Test
	Mean +SS Med (Min-Max)	Mean +SS Med (Min-Max)	Mean +SS Med (Min-Max)	Mean +SS Med (Min-Max)	
SBE Program	18,68 ±1,70 19,0 (16-23)	17,68 ±2,73 18,0 (12-23)	18,90 ±4,55 19,5 (8-26)	14,50 ±4,04 14,5 (7-22)	Chi-square =18,125 df=3 p<0.001
First Clinic Test	19,65 ±2,87 20,0 (14-24)	Pandemic	16,36 ±4,20 16,5 (6-22)	19,32 ±3,76 20,0 (10-24)	Chi-square =7,873 df=2 p=0,020
Second Clinic Test	22,12 ±2,45 23,0 (15-24)		23,32 ±2,44 23,5 (18-24)	21,87 ±2,78 22,0 (16-23)	Chi-square =4,430 df=2 p=0,109
Friedman Test	Chi-square =18,264 df=2 p= <0.001		Chi-square =27,90 df=2 p=0,001	Chi-square =24,99 df=2 p=0,001	

Transfer of Intern Students' Simulation-Based Training Program Achievements to the Clinical Environment and their Advanced Development

As seen in Table 2, the mean scores of the groups for the SBE Program in simulated environment were close to the average scores obtained in the first week of the Emergency Medicine Internship clinical environment (First Clinic Test)

In the last week of the Emergency Medicine Internship (Second Clinic Test), the scores were increased in all three groups.

Due to the pandemic, the clinical performance analysis could not be performed in group B.

In the analysis performed with the Kruskal Wallis test, a statistically significant difference was found between the groups in the First Clinic Test (p <0.05). The differences between groups in the Second Clinic Test were not statistically significant (p> 0.05).

4. DISCUSSION

In this study the effectiveness of the SBE clinical preparation program was evaluated by observing the performance of the intern students on critical patient management both in the simulated environment and then in the real clinical environment. As a result of the performance evaluation, the groups acquired the targeted competencies in simulated environment but the differences between the groups were found. When the transfer to the clinic and the development process were evaluated, it was determined that the transfer was provided in all groups and developed until the end of the internship without significant difference between groups. The opportunity of working together in a safe environment prior to clinic, educators and students were able to get to know each other better and to be aware of the performances individually.

Watmough et al. [12] applied unexpected patient scenarios to senior medical faculty students in their study and evaluated the program with questionnaires immediately after the end of the education and immediately after the learners became doctors. As a result of the training conducted in a simulated environment after graduation, the learners found that it got easier to cope with unstable patients in the real environment. In our study, we could observe the actual benefit and transfer of skills to real clinical environment by assessing learners' performances at the bedside in real clinical environment.

Simulation acts as a bridge between classroom lectures and clinical practices as a training method [13]. Simulation is still considered as a very good training strategy in terms of providing the participants with the

opportunity to apply their theoretical knowledge with scenarios in a simulated environment without putting patients at risk, and conceptualizing the knowledge under the mentorship of the trainers with debriefing and observing how the existing cognitive schemes are reflected in the practice [14,15]. Integration of SBE into curriculum is important for preparation of students to real clinical environments.

5. CONCLUSION

Simulation based education offers learners the opportunity to convincingly experience complex processes in a real like clinical settings without the risk of harming the patient. Real clinical experience is important for improving critical patient management skills.

6. ACKNOWLEDGMENT

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