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ORIGINAL INVESTIGATION

Use of simulation to teach in the operating room — Don't let the COVID-19 pandemic interrupt education:an observational clinical trial

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Abstract
Background: Simulation-based education has become the most important part of resident training in anesthesiology, especially during the pandemic. It allows learning the skills and the management of different situations without putting residents in risk of contamination, considering COVID-19 is highly contagious. The hypothesis was that simulation is still associated with improvement of knowledge acquisitions despite the context of the COVID-19 pandemic.
Methods: Residents of anesthesiology and intensive care subjected to an anaphylaxis simulation scenario. Their knowledge levels were assessed by true/false questions before and one month after the simulation session. The STAI test was used to measure anxiety levels before and after the scenario. Data were analyzed statistically using Wilcoxon and McNemar tests.
Results: Junior residents (< 2 years) received significantly higher scores in post-training theoretical tests compared to their pre-training scores (79.2 ± 9.6, 84.5 ± 8.2, $p = 0.002$, n = 21). There was no difference between pre- and post-test scores of seniors (80.2 ± 9, 81.8 ± 10.4, $p = 0.3$). Pre- and post-anxiety inventory scores were nearly the same and both were in the moderate group (39.8 ± 10.1, 39.3 ± 12.1, $p = 0.8$).
Conclusion: Simulation-based education improved the knowledge levels of the residents without raising anxiety levels. Thus, simulation-based training showed its value as an important tool of education during the pandemic, which needs to be further popularized for training at all institutions. Enlightening medical educators about this accomplished teaching method may lead to improved quality of medical education in developing countries and reshape how tomorrow's doctors are trained during pandemics.

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Introduction

During the COVID-19 pandemic, continuation of medical education programs has been interrupted because of restrictions, thus simulation training method was introduced for education and Anesthesiologists must manage different types of emergencies. In an emergency, it is essential to make a quick decision and to perform interventions at a proper time. Using all the knowledge and skills which were gained during the residency, requires practice. Through technological development and high-fidelity mannequins, residents have the opportunity to learn the skills and the management of different kinds of emergencies before facing them in real patients.[1,2]

Anaphylaxis is one of the rare but fatal emergencies. However, it is documented that after life-threatening allergic reactions morbidity is common and management of this emergency needs to be improved.[3]

University of Lyon is a highly experienced center for simulation training, it held master-class courses for instructors. As Ankara University educators, we attended one of these courses. We used an anaphylaxis scenario for in-situ simulation training in the operating room. The primary goal of this study was to evaluate the difference between the pre- and post-simulation knowledge test scores to evaluate the effectiveness of simulation training. The secondary goal was to examine whether it creates any anxiety on participants.

Methods

Subjects

This prospective, observational, single-center study was approved by the Ethics Committee of the Ankara University School of Medicine (Serial number: I4-166-19). After informed consent, 42 residents of the Department of Anesthesiology and Intensive Care were included in the study, without taking into consideration their training levels. Two of them did not want to participate in the study. Forty residents were randomly divided into seven groups of 5 or 6 residents in each group. The information on the seniority of residents, pre-test and post-test scores, and anxiety levels by the state-trait anxiety inventory before the session were collected.

Study design

Before the simulation session, all subjects undertook a pre-test, including 20 theoretical true/false questions, assessing their basic knowledge about anaphylaxis mechanism and treatment strategies. The total score was 100, with 5 points for each question. Besides, subjects' anxiety levels were assessed by the State-Trait Anxiety Inventory (STAI).[4] STAI consists of two 20-item scales for measuring the intensity of anxiety as an emotional state (S-Anxiety) and individual differences in anxiety proneness as a personality trait (T-Anxiety). STAI scores are classified as "no or low anxiety" (20—37), "moderate anxiety" (38—44), and "high anxiety" (45—80).[5]

Following this, based on their randomization, all subjects received a short scenario about anaphylaxis in the operating room (Supplemental file-1) using the Resusci Anne mannequin (Laerdal Medical, Stavanger, Norway). In-situ simulations were limited to 15-min duration, followed by a 30-min standardized debriefing to review technical skills, non-technical skills, and knowledge gaps. After the simulation training, residents were requested to complete STAI again.

Finally, they were requested to stop reading about anaphylaxis until they were assessed with a post-test, one month after the session with the same questions.

Statistics

Descriptive statistics for the categorical and continuous data were given as frequency (percentage) and median (minimum-maximum), respectively. Changes in the correct answer percentage regarding each question were evaluated using the McNemar test, and pre-post differences in the total score were compared with the Wilcoxon Signed Rank Test. All statistical analyses were performed with Statistical Package for Social Sciences (SPSS Version 15.0, Chicago, IL), and the level of statistical significance was set to 0.05.

Results

Forty residents were divided into two groups as seniors and juniors regarding their year of training 2 years of training accepted as a cut-off value for being senior. Out of 40 subjects, 21 had a working experience of less than 2 years (Fig. 1).

The theoretical score improved from 79.7 $\pm$ 9.2 to 83.2 $\pm$ 9.3 (p = 0.04) in pretest and posttest results. Junior residents (< 2 years) received significantly higher scores in post-tests compared to their pre-test scores (79.2 $\pm$ 9.6, 84.5 $\pm$ 8.2, p = 0002). However, there was no significant difference between pre- and post-test scores of seniors (80.2 $\pm$ 9, 81.8 $\pm$ 10.4, p = 0.3) (Fig. 2). Juniors scored higher than seniors in the post-test (84.5 $\pm$ 8.2, 81.8 $\pm$ 10.4, p = 0.236).

Both state and trait STAI scores were calculated, however only the state component is reported here as a reflection of anxiety experienced at the day of the simulation training. The pre-STAI-S score was 39.8 $\pm$ 10.1 while the post STAI-S score was 39.3 $\pm$ 12.1. There was no difference between the pre- and post-state-trait anxiety inventory scores (p = 0.8) (Table 1).

Discussion

While there was an improvement in posttest scores compared to pretest, this increase was more significant for the junior residents. Even the posttest scores of the juniors were higher than the seniors, while there was no significant difference between pretest and posttest scores of seniors. Besides, the simulation training did not make any difference in anxiety scores.

Since March 2020, face to face medical education lectures, bedside visits, hands on practices in clinics had to discontinue for a while due to the pandemic restrictions. Training programs had to be restructured according to the new normal and simulation-based learning became much more important.[6] Faculties needed to determine a new road map for residents.[7,8] While the academic community is worrying about how to educate particularly the ones who have no experience in the operating room, this study may paint a promising picture.

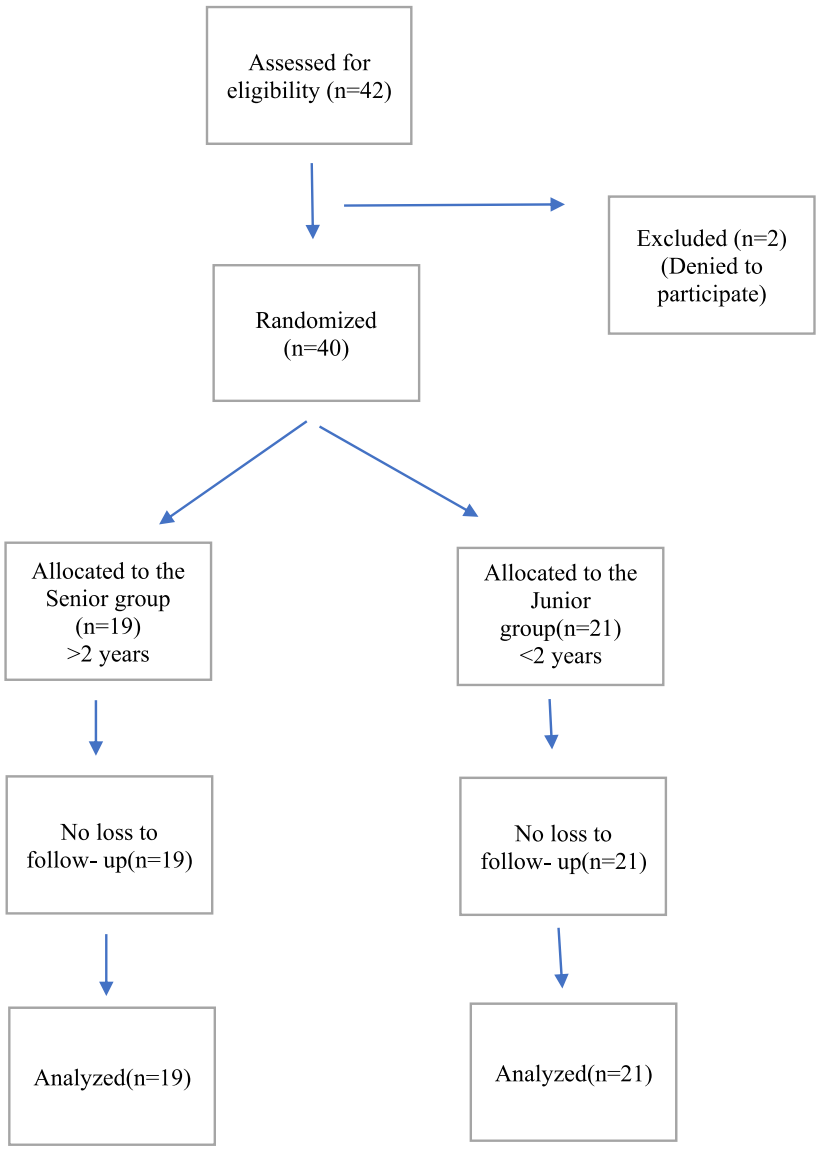

Figure 1 Flow chart depicting the study process.

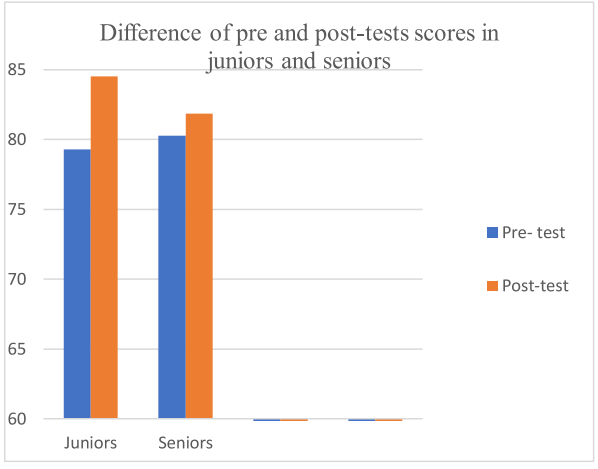

Figure 2 Pre- and post-test scores of juniors and seniors.

Simulation-based training gives health care providers the opportunity to develop their skills to manage real-life cases in the hospital.[9] In this study, true/false questions were used to assess the efficacy of the simulation session which was supposed to improve the knowledge scores of participants. In a recent study by Shailaja et al from India,[10] 22 anesthesia residents had six scenarios. After that, they took pre and post simulation multiple choice question tests and the mean knowledge score was improved by 51%, whereas the mean knowledge score from pretest to posttest improved by 4.3% in our study. Furthermore, in another study by Etanaa et al. from Ethiopia,[11] non-physician anesthetists attended a 3-day course and they had nine simulation scenarios, and eventually, the posttest scores improved by 16%. This difference in results may be related to the timing of the post-tests. While Shailaja et al. applied the test right after the simulation session, Etanaa et al. applied the test after the end of all 3-day sessions. In our study, we aimed to evaluate the impact of the simulation training

Table 1 Knowledge test and anxiety scores.

	Pre-test score	Post-test score	*p*	Pre-STAI	Post-STAI	*p*
Juniors	79.2 ± 9.6	84.5 ± 8.2	0.002	38.9 ± 8.4	38.7 ± 10.4	0.8
Seniors	80.2 ± 9	81.8± 10.4	0.3	40.7 ± 11.8	40.1 ± 10.4	0.8

method on long-term knowledge retention, so the questions were given one month after the simulation session. The increase in the scores of junior residents demonstrated the success of this education modality in long-term learning.

Anxiety can be seen in those who did not participate in any simulation training. Stein, C found that, post-simulation STAI scores of emergency medical care students were significantly higher than pre-simulation scores in scheduled simulation assessments.[12] In our study, moderate anxiety was detected in the participants. The fact that none of them had participated in any simulation training before may have caused moderate anxiety scores. In addition, the fact that this session was reported as training rather than evaluation may have caused this score not to increase.

During the pandemic, healthcare workers have a lot to bother about. Residents feel uneasy about patient safety, personal safety, and their education.[13] As educationists, one of our duties should be to protect our residents from burnout during a pandemic and keep them enthusiastic about learning. It will be wise if we use the simulation method to teach them without loading another stress factor during these difficult times.

As an outcome of our perfect collaboration with the simulation team of Claude Bernard University, this scenario represents the first successfully performed simulation-based training at our institution. Furthermore, our experience with the University of Claude Bernard indicates the importance of collaborative workshops and master classes as good tools for the dissemination of this educational modality.

Limitations

Pre- and post-knowledge test questions that we used were chosen from our department's exam questions. Although these questions have not been validated, we have been using these questions to evaluate our residents' theoretical knowledge. Our results may be more impactful if our questions are validated.

We highlight the importance of simulation training, but our study comprised one emergency scenario although similar studies contain more scenarios. We indicate no difference between pre- and post-STAI scores. We held the simulation session with our residents in our operating room so, not only the environment but also trainers and the other participants were familiar to subjects and maybe anxiety scores could be different if this was a multicenter simulation with residents from different clinics. Future research with a larger number of scenarios and subjects from several clinics is required to demonstrate anxiety levels.

Conclusion

As the response to the COVID-19 pandemic restricted in-person activity, medical schools had to invent new ways to educate. Arrangements had to be made for students to retain clinical skills and knowledge to prepare them for real-life crises. Simulation is an effective training modality, which can be used to improve knowledge levels without any serious change in the state of anxiety of participants.

Conflicts of interest

The authors declare no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.bjane.2021.11.010.

References

1. Yunoki K, Sakai T. The role of simulation training in anesthesiology resident education. J Anesth. 2018;32:425—33.
2. Green M, Tariq R, Green P. Improving patient safety through simulation training in anesthesiology: where are we? Anesthesiol Res Pract. 2016:4237523.
3. Harper NJN, Cook TM, Garcez T, et al. Anaesthesia, surgery, and life-threatening allergic reactions: management and outcomes in the 6th National Audit Project (NAP6). Br J Anaesth. 2018;121:172—88.
4. Spielberger CD, Lushene RE, Jacobs GA. Manual for the State-Trait Anxiety Inventory, STAI (Form Y). Palo Alto, Consulting Psychologists Press; 1983.
5. Kayikcioglu O, Bilgin S, Seymenoglu G, Deveci A. State and trait anxiety scores of patients receiving intravitreal injections. Biomed Hub. 2017;2:1—5.
6. Chaplin T, McColl T, Petrosoniak A, Hall AK. Building the plane as you fly": Simulation during the COVID-19 pandemic. CJEM. 2020;22:576—8.
7. O'Brien JM, Deck M, Goncin U, Chaya M. Impact of the COVID-19 pandemic on anesthesia residency education. Can Med Educ J. 2020;11:e126—8.
8. Zarezadeh Y, Nasseri K. COVID-19 pandemic: demand creates its own supply in a residency program. Braz J Anesthesiol. 2020;70:688—9.
9. Chacko TV. Moving toward competency-based education: challenges and the way forward. Archiv Med Health Sci. 2014;2:247.
10. Shailaja S, Hilda SS, Pinto PA, D'Cunha RJ, Mahmood LS, Hegde RB. Evaluation of resident satisfaction and change in knowledge following use of high-fidelity simulation teaching for anaesthesia residents. Indian J Anaesth. 2019;63:908—14.
11. Etanaa NB, Benwu KM, Gebremedhin HG, Desta HB. The effect of simulation-based training in non-physician anesthetists in Tigray region, Ethiopia. BMC Res Notes. 2020;13:197.
12. Stein C. The effect of clinical simulation assessment on stress and anxiety measures in emergency care students. Afr J Emerg Med. 2020;10:35—9.
13. Persad A. RE: Residents during the pandemic. CMAJ. 2020;192:E340—1.