Original Article

Effectiveness of Simulation Based Learning in Medicolegal Training of Medical Officers

Talha Naeem, Ambreen Usmani

ABSTRACT

Objective: The present study is aimed to compare the effectiveness of simulation-based learning with didactic lecturing in medico-legal training of medical officers.

Methodology: A quasi experimental study design (pre-test, post-test) was implemented. It included 44 medical officers who were deputed at Forensic Medicine Department of Quaid-e-Azam Medical College, Bahawalpur for medicolegal training from 15th May 2024 to 30th May 2024. The sample was collected using a convenient sampling technique. All the medical officers were divided into two groups; one group (Group-A) underwent didactic lecturing whereas the other underwent simulation-based learning (Group-B). Likert scale was used to assess the knowledge and skills of both groups. Pre- and post-test scores evaluated the learning outcomes. The self-confidence of medical officers was measured through a self-assessment questionnaire.

Results: A total of 44 medical officers were included in the study, with 22 in each group. The pre-test score of Group A and B was 6.4±0.4 and 5.6±0.5 respectively, whereas the post-test score was 7.3±0.3 and 9.0±0.2, respectively. A significant improvement was seen in post-test scores than pre-test scores ($p<0.001$). Moreover, the simulation-based learning group had a higher post-test score than the didactic lecturing group. Also, a higher confidence level was observed in medical officers undergoing simulation-based learning in managing different scenarios.

Conclusion: The present study found that medical officers gained valuable experience from simulation-based learning in confronting ethical dilemmas and complex legal cases encountered in their clinical practice by negotiating with real-time scenarios.

KEYWORDS: Effectiveness, Medical officers, Medicolegal, Simulation-based Learning.

INTRODUCTION

Simulation-based learning (SBL) has been established as a well-recognized learning technique in medical education.[1] SBL has also moved towards the mannequins ranging from low fidelity to moderate and high-fidelity simulators. Simulation labs provide congenial ambience of learning a skill without the fear of endangering the life of patients.[2,3] All these instruments are aimed towards achieving the highest level of learning outcome in all the three domains of Miller's triangle. The importance of simulation-based learning in augmenting motivation, self-efficacy, critical thinking and confidence cannot be over emphasized.[4,5] Simulation based learning is equally helpful in improving learning abilities in undergraduate students especially in developing clinical skills without their exposure to critically ill patients.[6]

In Pakistan, medical educationists are trying to introduce SBL in medical institutes as one of the modes of information transfer (MIT). Studies have shown that the procedural skills of trainee doctors have actually improved once they were exposed to simulation-based learning.[7] In our settings, undergraduate simulation-based learning not only helped in improving integrated clinical skills without the fear of patients in pre-clinical classes but has also shown commitment towards fostering

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communication skills of the students in medical schools.[8,9] Conduction of medico-legal work is an important task assigned to the medical officers working in public sector hospitals. It is a special skill learnt over a period and yet the doctor's confidence shatters after facing a challenging case. The newly appointed medical officer who does not know much about this specialized field cannot generate a standardized medico-legal report acceptable in the court of law, without getting sufficient training in medico-legal work. These inexperienced doctors having little knowledge of medico-legal work results in faulty preparation of medico-legal reports.[10] The medico-legal training provided to newly appointed doctors is conventional and primarily based on didactic lectures. The real-life medico-legal cases cannot be adequately used for medico-legal training because of the agony and suffering experienced by patients and their attendants. It is due to this fact that the level of medico-legal training on real-life patients limits to observation status only. Paucity of data exists regarding the utilization of simulation-based learning in imparting medico-legal training for these doctors. Therefore, the rationale of this study was to determine the more effective mode of information transfer between the simulations based learning and didactic lectures (conventional technique). The present study aimed at helping the medical educationists to design a better learning strategy for the doctors to impart medico-legal training, which improves their conduction of medico-legal work in the public sector hospitals.

METHODOLOGY

This quasi experimental study design (pre-test, post-test) included 44 Medical officers who were deputed at Forensic Medicine Department of Quaid-e-Azam Medical College, Bahawalpur for medicolegal training from 15th May 2024 to 30th May 2024. Approval from institutional ERB was sought prior to the commencement of this study Vide no. 2369/DME/QAMC Bahawalpur, dated 05-03-2024. The sample was collected using a convenient sampling technique. All the medical officers were divided into two groups by simple random probability method; one group (Group-A) underwent didactic lecturing whereas the other underwent simulation-based learning (Group-B). Medical officers of either gender working in a public sector hospital and involved in medicolegal work for less than one year, with no prior medicolegal training, and appointed as medical officers for the first time after completing their house job were included in the study. Those with more than one year of job experience or who had previously received medicolegal training, either at the induction level or as a refresher course, were excluded. Sample size of 44 for both the groups (22 for each group) has been calculated with 95% confidence level, 90% power of test, taking anticipated mean of Group A as 29.81± 4.27 and Group B as 23.84 ± 2.18.[3] All the medical officers underwent medicolegal training session continued for 3 days covering firearm injuries, general traumatology and declaration of injuries as per Qisas and Diyat (Q&D) Law on a medicolegal certificate. The clinical scenarios covered the topics focusing history taking, examination, investigations and interpretation of investigation as per Q&D Law. Likert scale was used to assess the knowledge and skills of both groups. Pre- and post-test scores evaluated the learning outcomes. A self-assessment questionnaire was used to measure their self-confidence.

SPSS version 22 was used for the data analysis. Mean and standard deviation was used to calculate the pre-test and post-test of both groups. An independent t-test was applied to determine any significant difference between pre-test and post-test of both groups. A paired t-test was applied to examine any difference between the mean pre-test and mean post-test scores in critical thinking and self-confidence within the same group. Comparison of effectiveness between both groups was achieved through chi-square test and p value ≤ 0.05 was taken as significant.

RESULTS

Each group comprised 22 medical officers. The pre- and post-test scores of Group A and Group-B was 6.4±0.4 vs 5.6±0.5 and 7.3±0.3 vs 9.0±0.2, respectively. Pre-test scores of both groups showed no significant differences. The post-score of both

Table-I Comparison of pre- and post-test scores in both groups			
Groups	**Pre-test score**	**Post-test score**	**P-value**
Group-A (Didactic Lecturing)	6.4±0.4	7.3±0.3	0.06 (NS)*
Group-B (Simulation-based learning)	5.6±0.5	9.0±0.2	<0.001 (HS)**

*NS: Not-significant HS**; highly significant
P value ≤ 0.05 taking as significant

groups demonstrated significant improvement compared to their respective pre-test scores ($p<0.001$). Moreover, the didactic lecture group post-test score was significantly lower than simulation group. Medical officers showed higher confidence in managing the scenario through simulation-based teaching, despite both methods receiving similar overall ratings. A self-questionnaire was utilized to assess the medical officers' perspective on both teaching methods.

Table-II The significant improvement in post-test score over pre-test score			
Groups	**Pre-test score**	**Post-test score**	**Paired t-test**
Group-A (Didactic Lecturing)	6.4±0.4	7.3±0.3	T (25) = 4.79
Group-B (Simulation-based learning)	5.6±0.5	9.0±0.2	T (25) = 8.7

The material covered was considered superior in lecture-based instruction. Simulation-based teaching was associated with medical officers feeling more confident in managing different scenarios. Additionally, participants reported a higher level of engagement in simulation-based learning, although both methods fulfilled expectations and garnered comparable overall ratings on the Likert scale. Comparison of pre- and post-test scores in both groups is shown in Table-I. The significant improvement in post-test score over pre-test score is shown in Table-II. The medical officer perception about teaching methods is shown in Table-III.

Table-III Medical officer perception about teaching methods					
Groups	**Material Covered**	**Confidence**	**Expectation**	**Overall Rating on Likert scale**	**P-value**
Group-A (Didactic Lecturing)	3.8 ± 0.3	3.4 ± 0.3	3.9 ± 0.2	3.9 ± 0.2	0.29
Group-B (Simulation-based learning)	3.6 ± 0.2	3.6 ± 0.2	4.0 ± 0.2	4.1 ± 0.1	0.19

P value ≤ 0.05 taking as significant

DISCUSSION

The present study mainly focused on the effectiveness of simulation-based learning in medicolegal training of medical officers and found that the utilization of simulated scenarios has shown to enhance the understanding and practical application of medico-legal principles among medical officers. The study found marked increases in factual learning and knowledge acquisition among medical officers who received simulation-based training, which exceeded those who participated primarily in didactic learning, over a 15-days course. This difference highlights the benefits of high-fidelity simulation training in enhancing doctors' understanding and knowledge retention compared to traditional didactic learning methods.

The content quality of the simulation-based training (SBT) curriculum appears to play an important role in raising medical officers' confidence in tackling complex medicolegal cases with professional knowledge and skill. This finding agrees with the results of a questionnaire study that examined medical students' mood and confidence levels after participation in simulation-based exercises, as documented in previous research.[11] Our findings are consistent with the results of a study by Hogg et al., where final year medical students were subjected to unexpected simulated scenarios during their clinical training.[12] The training was assessed with a questionnaire immediately after the course and subsequent interviews were conducted as students transitioned to the first year of training.

Medical staff expressed overall satisfaction with the content, the combination of teaching methods, and the appropriate learning environment.

Our training program closely adhered to recommended guidelines for educational programs for newly qualified doctors.[13] This confidence demonstrates that our program successfully met the standards and requirements needed to provide comprehensive training for medical professionals entering their practice as initial medicolegal examiners, thus making them ready and competent in clinical practice.

Traditional didactic lectures often require less active engagement from students, which reduces knowledge retention.[14] To optimize the desired academic outcomes, it is important to choose educational methods carefully, with retention rates being one measure of success. Active academic participation and cooperation between students significantly increases student retention rates.[15] Simulation-based learning is one of the ways to ensure that students are actively engaged in the learning process. Studies revealed that about 90 percent of students recalled the provided information which is being highest when simulating a real experience, compared to just hearing lectures (approximately 20%).[16,17] This confirms how learning based on simulation is so effective in promoting deep understanding and long-term knowledge retention.

When combined with small group learning, lectures can be very effective in increasing both knowledge and confidence. However, this effort may not be without uncertainty in terms of access to technology.[18] Conversely, simulation-based training can be enhanced by incorporating didactic lectures, especially during debriefing sessions. This approach, when applied to a surgical discipline, has shown improved processing of new information and increased knowledge retention.[19] Thus, to incorporate educational discourses into training-based simulation, the debriefing process can provide a comprehensive approach to skill acquisition and knowledge development.

Simulation-based medical education (SBME) is a versatile research tool with multiple goals, including understanding complex clinical scenarios, evaluating the feasibility and effectiveness of interventions, assessing stake-holder acceptance of interventions, and providing data for economic modeling. A study of SBME found that larger SBME teachers were associated with higher levels of SBME implementation at the community level.[20] This suggests that having a sufficient number of qualified teachers in SBME may affect acceptability of medical educational programs, outcomes, and clinical skills.[21]

An earlier study conducted to analyze and evaluate simulated parameters of fourth year medical students found that simulation-based training was superior to didactic lectures. Although didactic lecture covered a mean content of 3.9 with a standard deviation (SD) of 0.1, the simulation group scored slightly lower at 3.7 (not significant) and total ratings did not differ significantly between the two groups.[22] However, our study was limited to knowledge acquisition, whereas other studies have shown that high fidelity simulation leads to equivalent immediate knowledge and knowledge retention so much better over time compared to lectures. Furthermore, another study on medical students indicated that simulation-based learning is perceived as an effective approach for enhancing knowledge, skills, and attitudes.[23]

CONCLUSION

Simulated scenarios enhance medical officers' understanding of medico-legal principles and prepare them for real-world ethical challenges. Implementing simulation-based training for newly inducted officers could improve case handling and reduce unnecessary referrals to district standing medicolegal boards.

Limitations: The sample size of our study is small. A large sample size should be aimed in future studies to authenticate the veracity of results observed in our study.

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Author Contributions:

Talha Naeem: conceived the study designed, carried out the data collection and statistical analysis and drafted the manuscripts.

Ambreen Usmani: Participated in its design and coordination. drafted, read and approved the final manuscript.

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