Oncology
and Radiotherapy©
18 (1) 2024: 001-006 • RESEARCH ARTICLE

Real patients in simulation context vs. bedside teaching in undergraduate nephrology course: a comparative study on academic achievement

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ABSTRACT

Background: Clinical education in medical and healthcare programs is fundamental to preparing future healthcare professionals. This study investigates the effectiveness of two distinct clinical training modalities in an undergraduate nephrology course: the use of real patients in a simulation context and traditional bedside teaching in a public hospital. The objective is to compare the impact of these approaches on academic achievement.

Methods: The study enrolled two separate student cohorts. The 2021 cohort received their clinical training in a simulation center within the medical school, with real patients participating after obtaining informed consent. The 2022 cohort underwent traditional bedside teaching in a public hospital. Both groups followed the same teaching and learning methods. Academic grades are analyzed and compared statistically.

Results: Results revealed that the 2022 cohort, trained in the hospital setting, outperformed the 2021 cohort in terms of academic achievement. The 2021 cohort achieved a mean score of 76.5, with a range of 63 to 92, while the 2022 cohort achieved a higher mean score of 82.4, ranging from 66 to 95. Statistical analysis using the Mann-Whitney test demonstrated a statistically significant difference between the two groups (<0.001).

Conclusion: This study highlights the advantages of hospital-based training, emphasizing the importance of real patient exposure and authentic clinical experiences in enhancing academic achievement. While simulation-based training remains valuable for skill development, hospital-based training provides a more comprehensive and authentic learning environment.

Keywords: simulation, bedside teaching, academic achievement

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Word count: 2970 **Tables:** 03 **Figures:** 04 **References:** 20

Received: 10 January 2024, Manuscript No. OAR-24-124940

Editor: 13 January 2024, Pre-QC No. OAR-24-124940 (PQ)

Reviewed: 20 January 2024, QC No. OAR-24-124940 (Q)

Revised: 28 January 2024, Manuscript No. OAR-24-124940 (R)

Published: 06 February 2024, Invoice No. J-124940

INTRODUCTION

Clinical education in medical and healthcare programs plays a pivotal role in shaping the competence and readiness of future healthcare professionals. The methods and settings in which clinical training occurs are critical factors influencing the acquisition of essential clinical skills, knowledge, attitudes, and the overall academic achievement of students. The training of a medical graduate requires the development of almost every domain of learning. Most core competencies require the application of more than one skill domain. The move towards competency-based medical education globally has highlighted this need and also the challenges to ensure the achievement of these competencies [1]. 'To study the phenomena of disease without books is to sail an uncharted sea whilst to study books without patients is not to go to sea at all', and: 'Medicine is learned by the bedside and not in the classroom' are quotes of the famous Sir William Osler [2].

Simulation-based medical education intervention is required to be carefully planned and implemented in a suitable context [3]. The present study aims to investigate the comparative effectiveness of two distinct modalities for clinical training in an undergraduate nephrology course: the use of real patients in a simulation context and traditional bedside teaching in a public hospital.

Medical and healthcare education programs face the challenge of balancing the need for providing students with authentic clinical experiences while ensuring patient safety, ethical considerations, and the achievement of desired educational outcomes [4]. Simulation-based training has emerged as an innovative approach, offering a controlled environment where students can practice their skills, develop diagnostic competencies, and enhance their confidence [3,4]. In contrast, bedside teaching in real clinical settings provides students with direct exposure to actual patients, emphasizing empathy, interpersonal communication, and the intricacies of the healthcare system [5,6]. Traditionally, bedside teaching has always been seen as a primary teaching modality in which most aspects of clinical practice can be demonstrated and trained. It was widely used across medical schools in the first half of the previous century, and was estimated to represent as much as 75 % of all clinical training in the 1960s [7]. The recent explosion of imaging and laboratory testing has decreased its use [8]. A frequently encountered reason for the decline in bedside teaching is the changing nature of teaching hospitals, especially the shortened admission of patients, which increases the workload

of physicians while decreasing the potential suitability of patients for bedside rounds [9,10]. Simulation may enhance performance and provide additional advantage to teamwork training compared to traditional teaching [11]. Another benefit, is that simulation-based assessments is found to have positive correlation in terms of outcomes related to patients [12].

This study focuses on a specific nephrology course within a six-year MBBS program, targeting fourth-year students. Nephrology is a discipline that demands a thorough understanding of renal diseases, diagnostic techniques, and patient management. By investigating the effectiveness of different clinical training modalities in this context, this research aims to contribute to the ongoing discussion surrounding the optimization of clinical education.

The 2021 cohort of students underwent their clinical training within a simulation center, with real patients participating after providing informed consent. In contrast, the 2022 cohort engaged in traditional bedside teaching within a public hospital. Both groups were exposed to the same teaching and learning methods, and their academic achievement was assessed through various evaluation methods, including written exams, logbooks, and clinical assessments. Data collection involved assessments such as MCQs, logbooks, participation in CBL sessions, OSPE, and OSCE. The results of these assessments, when compared, offer valuable insights into the impact of training modality on academic achievement.

OBJECTIVE

The objective of this study is to investigate the effectiveness of using real patients in a simulation context in an undergraduate nephrology course, as compared to traditional bedside teaching, in terms of academic achievement.

METHODS

This study employs a quasi-experimental design and focuses on a six-credit-hour course, including two credit hours of clinical training. The course is offered to fourth-year MBBS program students and covers various aspects of renal diseases, with a particular emphasis on clinical application, including history taking and physical examination. The specific learning outcomes of the training programs for both batches are the same. The 2021 cohort received clinical training in a simulation center, while the 2022 cohort underwent bedside teaching in a public hospital. Both cohorts received the same teaching and learning methods and were assessed using similar assessment methods. Assessments are designed to measure the same set of skills and competencies for both groups. Data collection involved assessments such as MCQs, logbooks, participation in CBL sessions, OSPE, and OSCE (Table 1).

Tab. 1. Assessment tasks and weighting

Assessment Task	Week Due	Percentage of Total Assessment Score
Mid-term written exam	3rd week	10%
Logbook	Continuous	10%
CBL assessment	Continuous	10%
OSPE	5th week	20%
OSCE	5th week	20%
Final written exam	5th week	30%
Total		100%

Statistical analysis

To evaluate the effectiveness of the training modalities, the final grades of the 2021 and 2022 student groups were subjected to descriptive and statistical analysis. The Mann-Whitney test was applied to determine the significance of the differences between the two groups. The significance level is taken as $p<0.05$.

RESULTS

The results revealed that students from the 2021 cohort achieved a mean score of 76.5, with a range from 63 to 92. All students passed, and their scores were normally distributed. In contrast, the 2022 cohort, with 75 students passing, achieved a mean score of 82.4, ranging from 66 to 95 (Figures 1 & 2). Their scores were not normally distributed (Table 2).

Tab. 2. Comparison of Student Performance in 2021 and 2022 Cohorts

Cohort	Mean Score	Range	Distribution
2021	76.5	63 - 92	Normally Distributed
2022	82.4	66 - 95	Not Normally Distributed

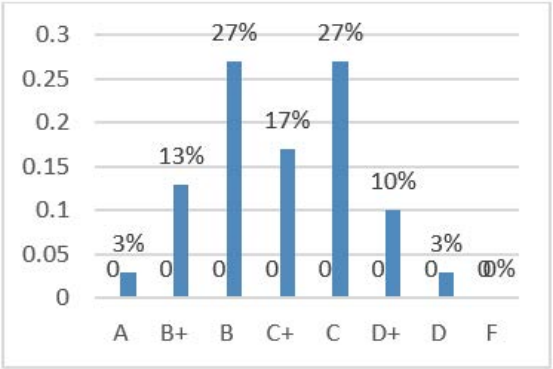

Fig. 1. Grade percentage of students in the year 2021

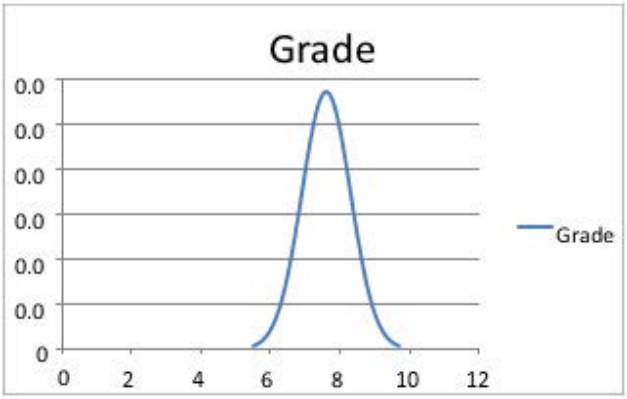

Fig. 2. Distribution of total grades for students in the year

Students of the year 2022 were 78 students in total, and 3 among them failed to attend the final exams. Their achievement is plotted in the (Figure 3). 75 students achieved the pass mark. The mean score was 82.4 and ranged from 66 to 95.

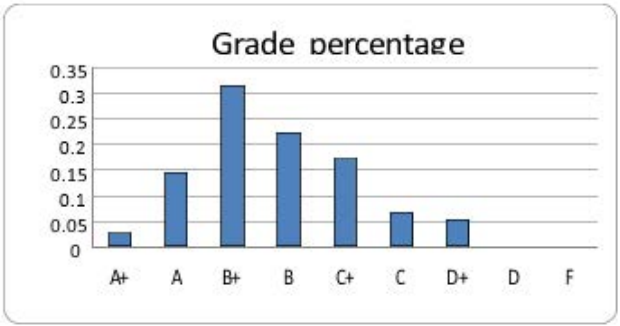

Fig. 3. Grade percentage of students in the year 2022

The result was not normally distributed. The standard deviation was 6.9 as shown in (Figure 4).

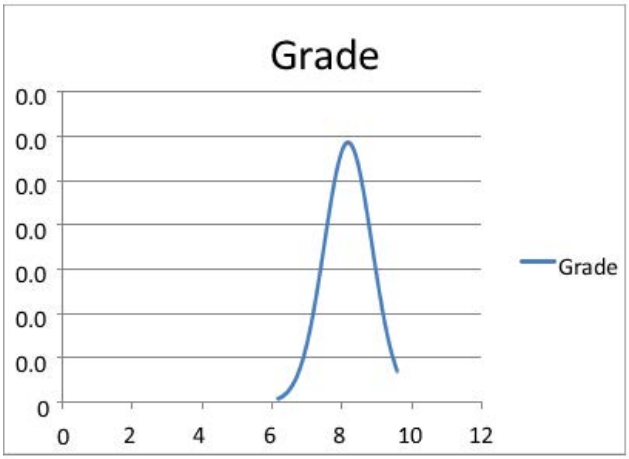

Fig. 4. Distribution of total grades for students in the year

The Mann-Whitney test indicated a statistically significant difference between the two groups, with the 2022 cohort performing significantly better in academic achievement (Table 3).

Tab. 3. Mann-Whitney Test Statistics

Test Statistics	Value
Mann-Whitney U	587
Wilcoxon W	1052
Z	-3.879
Asymp. Sig. (2-tailed)	<.001

These findings suggest that the hospital-based training in the 2022 cohort led to better academic achievement in the undergraduate nephrology course compared to the simulation-based training received by the 2021 cohort.

DISCUSSION

The findings of this study provide insights into the comparative effectiveness of two distinct modalities for clinical training in an undergraduate nephrology course, focusing on academic achievement. Our investigation compared the use of real patients in a simulation context and traditional bedside teaching in a public hospital. The 2022 cohort, which underwent hospital-based training, outperformed the 2021 cohort, which received training on real patients in a simulation context, in terms of academic achievement. They might have benefited from the authenticity and diversity of cases in the hospital.

The results of this study align with previous research emphasizing the benefits of real patient exposure in clinical education. The hospital-based training in the 2022 cohort provided students with authentic clinical experiences, which are valuable for developing diagnostic skills, enhancing patient interaction, and navigating the complexities of the healthcare system [13, 4]. The improved academic achievement in this group is indicative of the advantages of real-world clinical exposure, which allows students to apply theoretical knowledge in practical scenarios [5, 6].

Simulation-based training has been recognized for its ability to offer a controlled learning environment, which is particularly useful for initial skill acquisition and safe practice [14]. However, this approach may not fully replicate the nuances of real clinical settings and the associated ethical and emotional considerations [15]. This is particularly important in this case where the 2021 cohort is trained on real patients in a simulation context. While simulation-based training is essential for building foundational skills, it appears that the 2022 cohort, through their bedside teaching experiences, had the opportunity to consolidate their skills in an authentic clinical context, leading to superior academic performance. It's also important to note that the success of the approach adopted for the 2021 cohort depends on how well the simulation center is integrated into the overall curriculum and how effectively the scenarios are designed to meet educational goals.

The outcomes of this study are consistent with the notion that a combination of simulation-based and hospital-based training can be beneficial [16]. Simulation centers can provide a safe environment for skill development and initial exposure to clinical scenarios, while real clinical settings offer the complexity and authenticity necessary for comprehensive learning [17]. Evidence supports simulation as a useful educational technique if carefully planned in the curriculum [18]. Future educational programs may consider incorporating elements of both approaches to create a more balanced and effective clinical training experience.

It is worth noting that academic achievement is just one facet of clinical education, and the transferability of skills to real practice settings is a critical consideration. While this study focuses on academic outcomes, future research should investigate the long-term clinical performance and patient outcomes of students trained in different modalities. Furthermore, assessing the students' self-confidence, empathy, and communication skills in clinical practice is essential to gain a more comprehensive understanding of the impact of training on their overall clinical competence.

In comparison with no intervention, technology-enhanced simulation training in health professions education is consistently associated with large effects for outcomes of knowledge, skills, and behaviors and moderate effects for patient-related outcomes [19,20]. Research has proven simulation-based medical education with deliberate practice to be better than traditional clinical education regarding clinical skill acquisition [3]. It's important to note that the success of this approach still depends on how well the simulation center is integrated into the overall curriculum and how effectively the scenarios are designed to meet educational goals.

Limitations of the study

One of the limitations is the difference in the total number of the two cohorts (30 for 2021 & 78 for 2022). The study doesn't control for differences in the baseline knowledge or skills of students in the two cohorts. The research is conducted at a single medical school and therefore the results may not be representative of other educational settings, potentially limiting the external validity of the findings. The primary outcome measured, the student's grades, may not reflect the real difference in learning in the two modalities. Other measures may include Clinical skills proficiency, Confidence and self-assessment of clinical skills, Ethical considerations and professionalism, and Patient safety and communication skills.

CONCLUSION

This study highlights the advantages of hospital-based training, emphasizing the importance of real patient exposure and authentic clinical experiences in enhancing academic achievement. While simulation-based training remains valuable for skill development, hospital-based training provides a more comprehensive and authentic learning environment. The findings of this research not only inform the ongoing discussion about clinical education

but also suggest the potential benefits of a blended approach that combines simulation-based learning with real-patient encounters. Future medical and healthcare education programs can use these insights to design more effective and well-rounded clinical training experiences for students. The study opens the door to further investigations into the long-term clinical performance and patient outcomes of students trained in different modalities and the development of a more holistic understanding of the impact of training on clinical competence.

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