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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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STANDARDIZED PATIENT-BASED TRAINING AND CLINICAL DIAGNOSTIC COMPETENCE AMONG MEDICAL STUDENTS: A RANDOMIZED COMPARATIVE STUDY

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Abstract.

Aim of the study: The aim of this study was to compare standardized patient-based training with traditional didactic and manikin-based instruction in developing clinical diagnostic competence among mid-level medical students, and to assess whether baseline academic performance influenced this effect.

Material and methods: A single-center randomized comparative educational study was conducted among 498 medical students. Participants were assigned to either standardized patient-based training or traditional didactic and manikin-based instruction. Clinical diagnostic performance was assessed using the Objective Structured Clinical Examination (OSCE). Baseline academic performance was evaluated by grade point average (GPA). Subgroup analyses were performed according to academic performance. Statistical significance was set at $p<0.05$, and effect size was calculated using Cohen's d.

Results: Baseline GPA was comparable between groups. Students trained with standardized patients achieved higher OSCE scores than those receiving traditional instruction, with mean scores of 8.39 and 6.93, respectively. The effect size was large (Cohen's d=1.07). The greatest benefit was observed among students with average or lower baseline GPA, whereas high-performing students showed comparable outcomes across instructional modalities. Questionnaire responses from students in the standardized patient-based training group, lecturers and OSCE examiners favored standardized patient-based training for diagnostic reasoning, communication skills and clinical confidence, while manikin-based instruction was preferred for procedural skills.

Conclusions: Standardized patient-based training was associated with improved clinical diagnostic performance, particularly among students with average or lower academic standing. These findings support the integration of standardized patients into hybrid clinical curricula to strengthen diagnostic competence and communication skills.

Key words. Medical education, standardized patients, clinical competence, objective structured clinical examination, simulation-based training.

Introduction.

Medical education has traditionally relied on didactic teaching methods, including lectures, textbooks, seminars and theoretical case discussions. Although these approaches remain important for acquiring biomedical knowledge, they are often insufficient for developing practical clinical skills, diagnostic reasoning and effective communication with patients. The increasing complexity of clinical practice has created a need for educational methods that allow students to apply theoretical knowledge in structured and realistic clinical situations [1,2].

Simulation-based education has become an important component of contemporary medical training. It provides a safe environment in which students can practice clinical skills, receive feedback and improve performance without risk to real patients [3,4]. Simulation methods include task trainers, manikins, virtual learning tools and standardized patients, each with specific educational advantages when matched to clearly defined learning objectives [3,5].

Among these approaches, standardized patient-based training has gained particular importance. Standardized patients are trained individuals who reproduce clinical scenarios in a consistent and structured manner. This method allows students to practice history-taking, communication, physical examination and diagnostic reasoning in conditions resembling real clinical encounters [6-9]. Unlike real patients, whose presentations may vary, standardized patients provide reproducible learning situations for both formative teaching and structured assessment [7,9,10].

The Objective Structured Clinical Examination is widely used to assess clinical competence in medical students. Within OSCE-based assessment, standardized patients may contribute not only to evaluating technical clinical performance, but also communication, empathy, professional behavior and patient-centered interaction [11]. Therefore, integrating standardized patients into OSCE-oriented training may improve alignment between teaching methods and final performance assessment.

Despite the growing use of standardized patients, their implementation remains variable across institutions, especially in early and mid-level clinical diagnosis courses. In many programs, clinical diagnosis is still taught mainly through lectures, theoretical case discussions and manikin-based demonstrations. While manikins are valuable for procedural and technical skills, they cannot fully reproduce human communication, emotional responses and real-time diagnostic interaction [12-16].

Previous studies have reported positive educational effects of standardized patient-based training; however, direct comparisons with traditional didactic and manikin-based teaching remain limited. In particular, evidence remains insufficient regarding the influence of standardized patient-based instruction on OSCE performance, student confidence, examination-related anxiety and perceived educational effectiveness [16,17,18]. It is also unclear whether this effect differs according to baseline academic performance.

Clarifying these issues is important for curriculum design. Modern clinical education increasingly supports hybrid models that combine didactic teaching, manikin-based procedural training and standardized patient-based encounters, allowing

each method to be used according to its strongest educational purpose [3,19,20].

The aim of the present study was to compare standardized patient-based teaching with traditional didactic and manikin-based instruction in clinical diagnosis training among mid-level medical students. The study evaluated OSCE performance, perceptions of students, lecturers and examiners, and whether baseline academic performance modified the educational effect of standardized patient-based training.

Materials and Methods.

Study design and setting:

This study was designed as a single-center randomized comparative educational study conducted at a medical university. The study aimed to compare the effectiveness of standardized patient-based training with traditional didactic and manikin-based instruction in undergraduate clinical diagnosis education.

Data collection was conducted during the spring semester of the 2024-2025 academic year, from February to June 2025, among fifth- and sixth-semester medical students enrolled in the Clinical Diagnosis course.

The educational intervention was implemented within the Clinical Diagnosis course. The study was focused on the development of clinical diagnostic competencies, including history-taking, physical examination, diagnostic reasoning, communication skills and preparedness for structured clinical assessment.

Participants:

A total of 498 mid-level medical students participated in the study. All participants were enrolled in the fifth and sixth semesters of a 12-semester undergraduate medical program and were registered in the Clinical Diagnosis course during the study period.

Students were eligible for inclusion if they were actively attending the Clinical Diagnosis course and agreed to participate in the study. Students were excluded if they had previous exposure to standardized patient-based training or had previously participated in simulation-based educational research. Prior exposure to standardized patient-based teaching was assessed at enrollment by student self-report.

All 498 students assessed for eligibility met the inclusion criteria. No students were excluded before randomization on the basis of previous standardized patient-based training or prior participation in simulation-based educational research.

Randomization and group allocation:

Participants were randomly assigned to one of two study groups before the educational intervention. Simple randomization was used in order to reduce selection bias and ensure baseline comparability between the groups.

The experimental group received standardized patient-based training and included 241 students. The control group received traditional didactic and manikin-based instruction and included 257 students.

Random allocation was performed before the start of the intervention. All randomized students completed the assigned educational program and underwent final OSCE assessment. Therefore, all 498 participants were included in the final analysis. Participant flow is presented in Figure 1.

Educational interventions:

Students in the experimental group participated in structured clinical training using trained standardized patients. The training focused on history-taking, communication with the patient, clinical reasoning, physical examination elements and formulation of a diagnostic conclusion. Standardized patients were trained to reproduce clinical scenarios in a consistent manner, according to predefined scripts and educational objectives.

Students in the control group received conventional instruction, which included lectures, theoretical case discussions and manikin-based practical sessions. Manikin-based teaching was used mainly for demonstration and practice of selected physical examination and procedural elements.

The teaching content and learning objectives were standardized across both groups in order to maintain curricular consistency. Both groups were trained within the same Clinical Diagnosis course and covered comparable clinical topics during the study period.

Outcome measures:

The primary outcome measure was student performance in the Objective Structured Clinical Examination. OSCE stations were developed using standardized clinical scenarios and were assessed by trained examiners with structured checklists. The checklists included predefined assessment criteria related to history-taking, physical examination, diagnostic reasoning, communication skills and overall clinical performance.

Examiners applied uniform assessment criteria in order to improve objectivity and reliability of evaluation. The OSCE was conducted after completion of the educational intervention.

Subgroup analysis:

An exploratory subgroup analysis was performed according to baseline academic performance. Students were stratified by grade point average in order to examine whether academic standing modified the educational effect of standardized patient-based training.

This subgroup analysis was predefined as exploratory. It did not influence randomization, group allocation or the primary outcome assessment.

Bias reduction strategies:

Several measures were used to reduce potential bias. Standardized instructional materials and comparable educational objectives were used in both groups. OSCE stations were based on uniform clinical scenarios. Examiners received calibration training before the assessment in order to harmonize scoring criteria.

Where feasible, examiners were not informed about the instructional group allocation of students. The use of structured checklists and standardized assessment criteria was intended to reduce subjectivity during OSCE evaluation.

Ethical considerations:

The study protocol was reviewed and approved by the Institutional Ethics Committee of European University, Tbilisi, Georgia. The approval number was 7, dated December 15, 2024.

All participants provided written informed consent before enrollment. Participation was voluntary, and anonymized data were used for analysis. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Statistical analysis:

Statistical analyses were performed using IBM SPSS Statistics, version 21. Continuous variables were presented as mean ± standard deviation, and categorical variables as frequencies and percentages.

Between-group comparisons of continuous variables were performed using independent-samples t-tests, where appropriate. Survey-response distributions were analyzed using the chi-square goodness-of-fit test; when expected cell counts were small, an exact multinomial test was used. For categorical baseline comparisons, the chi-square test or Fisher's exact test was applied, as appropriate. A two-sided p-value <0.05 was considered statistically significant.

Effect size was calculated using Cohen's d to estimate the magnitude of between-group differences. OSCE performance was interpreted in the context of structured assessment, since station-level characteristics and examination conditions may influence student outcomes [18,21].

A formal a priori sample size calculation was not performed because the cohort size was determined by course enrollment. However, post hoc power estimation based on the observed effect size indicated adequate statistical power for detecting between-group differences.

Reporting standards:

Reporting of the study was aligned with relevant elements of the CONSORT 2010 guidelines applicable to randomized educational studies [22].

Results.

Baseline characteristics:

A total of 498 students were randomized and included in the final analysis. The standardized patient group included 241 students, while the traditional instruction group included 257 students.

Baseline academic performance was comparable between the groups. Mean baseline GPA was 2.94 ± 0.61 in the standardized patient group and 2.89 ± 0.53 in the traditional instruction group. The mean difference was 0.05, with a 95% confidence interval from −0.06 to 0.16. This difference was not statistically significant (t=0.85, p=0.39), confirming baseline comparability between the study groups. Participant flow is shown in Figure 1.

Primary outcome: OSCE performance

Students in the standardized patient group achieved significantly higher OSCE scores compared with students in the traditional instruction group. The mean OSCE score was 8.39 in the standardized patient group and 6.93 in the traditional instruction group. The comparison of OSCE performance between groups is presented in Table 1.

The between-group mean difference was 1.46 points, with a 95% confidence interval from 0.82 to 2.10. This difference was statistically significant (t=4.46, p<0.001). The standardized effect size was large, with Cohen's d=1.07.

OSCE score distributions are shown in Figure 2.

To further explore whether baseline academic performance influenced the educational effect of the intervention, an exploratory stratified analysis was performed according to GPA category.

Among high-performing students, defined as those with GPA >3.0, OSCE scores were comparable between the groups. The standardized patient group included 41 high-performing students, and the traditional instruction group included 61 high-performing students. The mean OSCE score was 9.7 ± 0.3 in the standardized patient group and 9.6 ± 0.4 in the traditional instruction group. The between-group difference was not statistically significant (p=0.153). These results are presented in Figure 3.

Among students with average or lower GPA, the standardized patient group achieved higher OSCE scores than the traditional instruction group. In this subgroup, the standardized patient group included 200 students and the traditional instruction group included 196 students. Mean OSCE scores were 8.1 ± 1.1 and 6.1 ± 0.6, respectively. This difference was statistically significant (p<0.01). These results are presented in Figure 4.

Student-reported outcomes:

Students in the standardized patient-based training group completed a post-OSCE questionnaire evaluating the perceived effectiveness of standardized patient-based training compared with traditional and manikin-based learning methods. A total of 241 students completed the questionnaire, and the results are summarized in Table 2.

Data are presented as number (percentage). Percentages were calculated using the number of respondents in the standardized patient-based training group as the denominator (n=241).

All respondents completed the same post-OSCE questionnaire with identical item wording and predefined response options. Among respondents in the standardized patient-based training group, standardized patient-based training received higher ratings for the development of diagnostic reasoning, preparedness for clinical practice, communication skills and clinical confidence. These differences were statistically significant for all listed domains (p<0.05).

Responses regarding reduction of examination-related anxiety were more evenly distributed and did not reach statistical significance (p=0.123).

Examiner survey results:

OSCE examiners evaluated student performance according to predefined domains. The results are presented in Table 3.

Data are presented as number (percentage). All examiners completed the same standardized post-OSCE questionnaire with identical evaluation domains and response categories.

Examiners reported stronger clinical reasoning and communication skills among students trained with standardized patients compared with those trained by traditional didactic and manikin-based instruction.

Ratings for procedural competence and perceived student anxiety were more evenly distributed between the two instructional approaches.

Lecturer survey results:

Lecturer perceptions are summarized in Table 4.

Data are presented as number (percentage). All lecturers

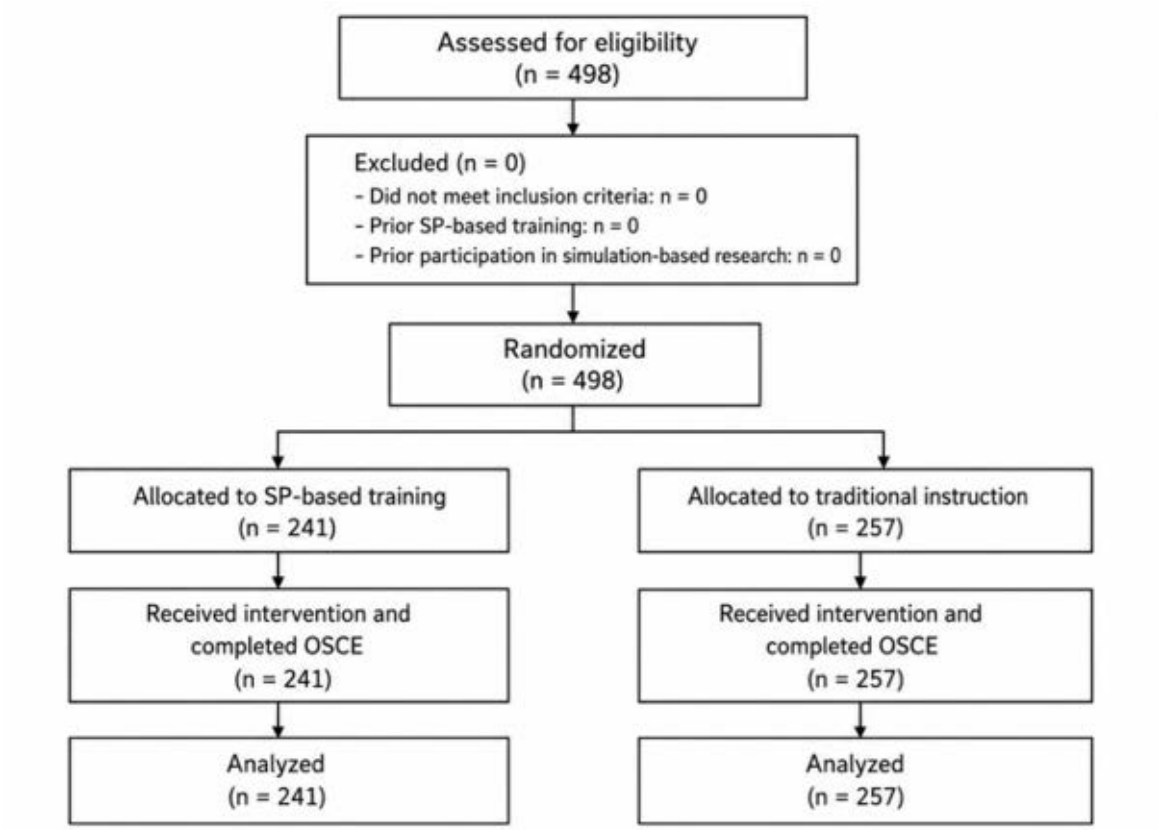

Figure 1. *CONSORT flow diagram of participant eligibility assessment, randomization, allocation, intervention completion, and analysis.*

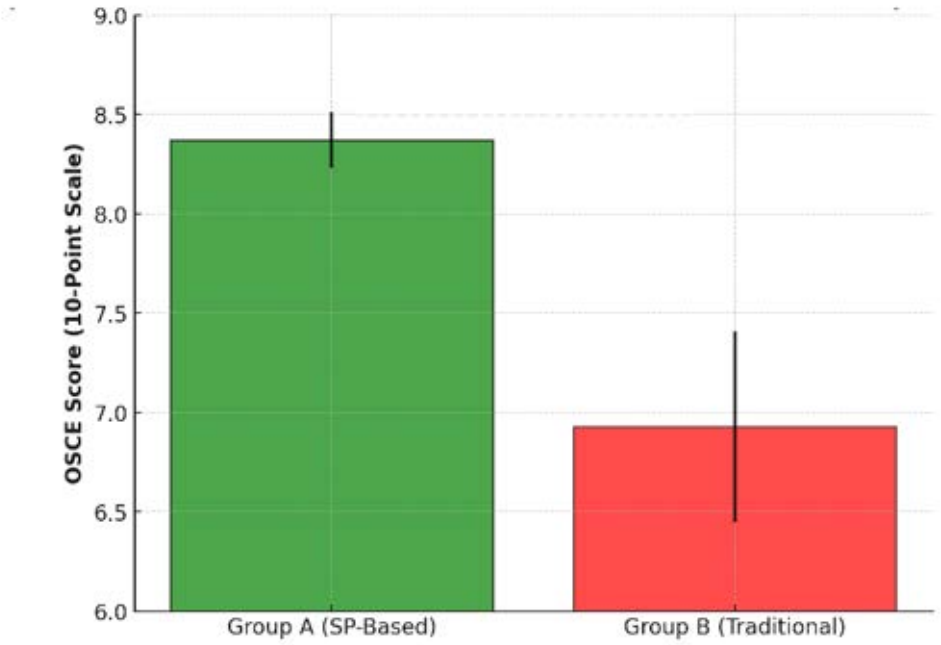

Figure 2. *Comparison of OSCE scores between SP-based (Group A) and traditional (Group B) training groups. Bar graph comparing mean OSCE scores with standard deviation. SP-based group significantly outperformed the traditional group ($p < 0.01$).*

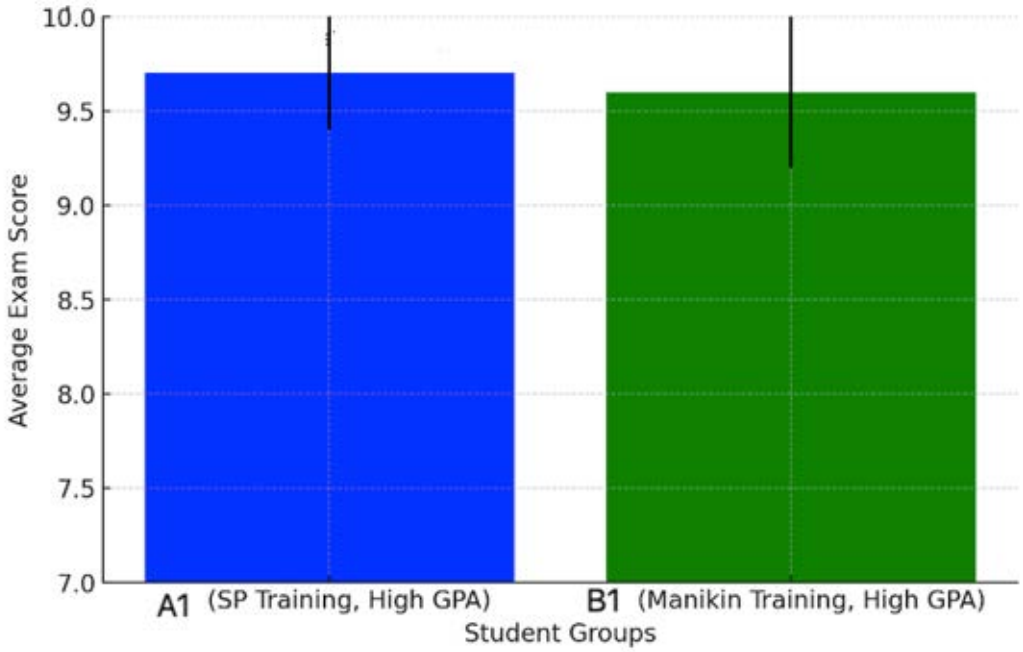

Figure 3. *OSCE performance among high-GPA students: SP-based versus traditional training Bar chart showing no significant difference between high-GPA students in the two groups (p = 0.153).*

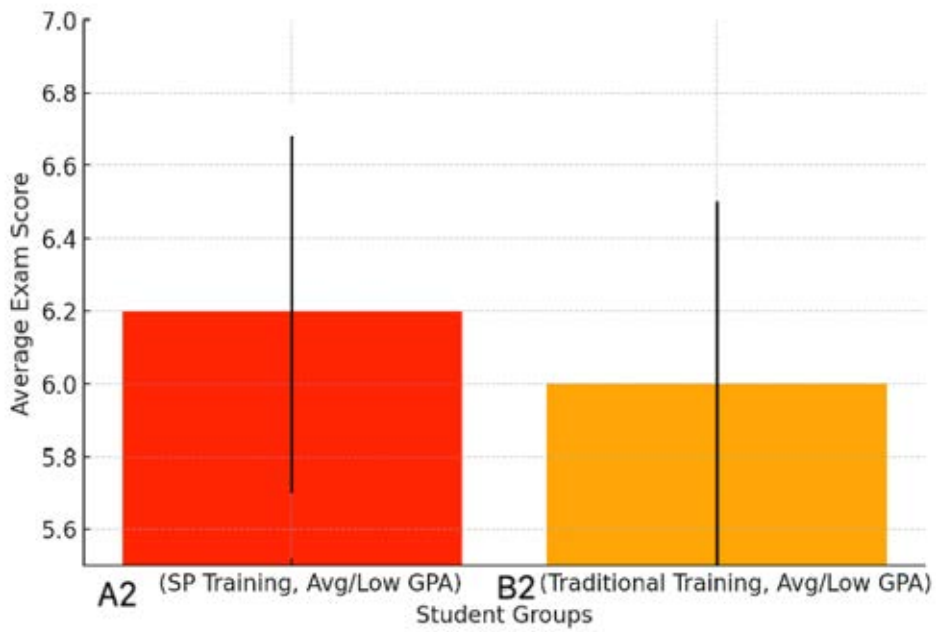

Figure 4. *OSCE performance among students with average or lower GPA: standardized patient-based versus traditional instruction. Bar chart showing significantly higher OSCE performance in the standardized patient group compared with the traditional instruction group (8.1 ± 1.1 versus 6.1 ± 0.6; p<0.01).*

Table 1. *Comparison of OSCE Performance Between Groups.*

Group	**Total Students**	**Total OSCE Points**	**Average OSCE Score ± SD**
Group A (SP-Based Training)	241	2023	8.39 ± 1.2
Group B (Traditional)	257	1781	6.93 ± 1.5

Table 2. *Results of the post-OSCE student questionnaire in the standardized patient-based training group (n=241).*

Questionnaire Domain	SP-Based Training Preferred n (%)	Both Methods Equal n (%)	Manikin-Based Preferred n (%)	P value
Impact on Critical Thinking	212 (87.9)	25 (10.3)	4 (1.65)	<0.05
Preparedness for Real-Life Scenarios	188 (78.0)	50 (20.7)	3 (1.2)	<0.05
Comparison to Manikin-Based Methods	190 (78.8)	40 (16.6)	11 (4.6)	<0.05
Confidence in Diagnostic Abilities	216 (89.6)	25 (10.4)	0 (0)	<0.05
Improvement in Communication Skills	200 (83.0)	39 (16.1)	2 (0.9)	<0.05
Reduction of Exam Anxiety	130 (53.9)	61 (25.3)	50 (20.8)	0.123
Preference for Future Training	180 (74.6)	50 (20.8)	11 (4.6)	<0.05

Table 3. *Results of the standardized post-OSCE examiner questionnaire on student performance by training modality.*

Evaluation Domain	SP-Based Training Preferred n (%)	Both Methods Equal n (%)	Manikin-Based Preferred n (%)
Clinical Critical Thinking & Decision-Making	16 (100)	0 (0)	0 (0)
Communication & Patient Interaction	16 (100)	0 (0)	0 (0)
Clinical Skills & Procedural Competence	7 (43.8)	1 (6.2)	8 (50.0)
Student Confidence Level	14 (87.5)	0 (0)	2 (12.5)
Student Anxiety Level	8 (50.0)	4 (25.0)	4 (25.0)
Quality of Feedback & Learning Effectiveness	13 (81.3)	1 (6.2)	2 (12.5)
Overall Preparedness for Clinical Practice	12 (75.0)	4 (25.0)	0 (0)

Table 4. *Results of the standardized post-OSCE lecturer questionnaire comparing educational methods.*

Evaluation Domain	SP-Based Training Preferred n (%)	Both Methods Equal n (%)	Manikin-Based Preferred n (%)
Critical Thinking & Diagnostic Skills	16 (100)	0 (0)	0 (0)
Communication & Professionalism	13 (81.3)	2 (12.5)	1 (6.2)
Decision-Making Under Pressure	14 (87.5)	2 (12.5)	0 (0)
Procedural / Technical Skills	0 (0)	4 (25.0)	12 (75.0)
Student Engagement	6 (37.5)	8 (50.0)	2 (12.5)
Exam Anxiety Reduction	2 (12.5)	10 (62.5)	4 (25.0)
Teaching Practicality	13 (81.3)	3 (18.7)	0 (0)
Support for Future Curriculum Integration	12 (75.0)	3 (18.7)	1 (6.3)

completed the same standardized post-OSCE questionnaire with identical item structure and predefined response options.

Most lecturers favored standardized patient-based instruction for the development of diagnostic reasoning, communication skills and clinical decision-making. In contrast, manikin-based training was more frequently preferred for procedural and technical skill acquisition.

Discussion.

This randomized comparative educational study showed that standardized patient-based training was associated with significantly better clinical diagnostic performance than traditional didactic and manikin-based instruction. Students trained with standardized patients achieved higher OSCE scores, with a large between-group effect. These findings support the value of experiential, patient-centered simulation in undergraduate clinical diagnosis training.

The results are consistent with previous studies showing that simulation-based education improves clinical competence, learner engagement and preparedness for real clinical encounters [7,12,23]. Standardized patient-based training provides structured opportunities to practice history-taking, communication, physical examination and diagnostic reasoning in a realistic but controlled environment. Unlike lecture-centered teaching, this approach allows students to apply theoretical knowledge in clinical situations and receive feedback on both cognitive and interpersonal performance [2,4,16,24].

An important finding was that the educational benefit of standardized patient-based training differed according to baseline academic performance. High-performing students achieved comparable OSCE results regardless of instructional modality, whereas students with average or lower baseline GPA showed greater improvement after standardized patient-based instruction. This suggests that SP-based training may be particularly useful for students who derive limited benefit from traditional lecture-based teaching.

Baseline academic performance may not fully predict performance in applied clinical tasks. In this study, students in the SP group tended to perform better than expected based on baseline GPA trends, whereas students in the traditional group showed OSCE results more closely aligned with previous academic standing. Although a formal interaction model was not performed, the subgroup findings suggest that standardized patient-based training may help reduce performance gaps among learners with different academic profiles.

These findings may be explained by active learning, situated learning and competency-based medical education principles. Standardized patient encounters require students to organize knowledge, communicate with a patient, formulate diagnostic hypotheses and make clinical decisions in real time. This

contextualized learning process may be especially beneficial for students who have difficulty transferring theoretical knowledge into practical clinical performance [13,16,25].

The consistency between OSCE outcomes and survey-based perceptions strengthens the interpretation of the results. Students reported improved diagnostic reasoning, communication skills, clinical confidence and preparedness for practice. OSCE examiners also rated SP-trained students more favorably in clinical reasoning and communication, while lecturers emphasized the value of standardized patients for clinical decision-making and patient interaction [10,12,22,26].

The findings do not suggest that standardized patients should replace other simulation modalities. Manikin-based instruction was considered more appropriate for procedural and technical skill acquisition, since manikins allow repeated practice of specific procedures and examination techniques in a controlled setting. Therefore, standardized patients and manikins appear to serve different but complementary educational purposes [5,9,27].

The results regarding examination-related anxiety were less uniform. No significant difference was observed between groups, and perceptions varied among participants. The realistic nature of SP encounters may reduce uncertainty for some students, while creating additional emotional pressure for others. Therefore, SP-based teaching should include structured preparation, feedback and debriefing to maximize educational benefit and reduce unnecessary stress [10,11,26].

Overall, the study supports a hybrid instructional model in clinical diagnosis education. Didactic teaching may provide theoretical foundations, manikin-based training may support procedural skills, and standardized patient-based encounters may strengthen communication, diagnostic reasoning and clinical decision-making. This approach is consistent with contemporary standards of simulation-based education, which emphasize alignment between learning objectives, simulation modality, deliberate practice and structured feedback [6,7,12,17,25,28].

The subgroup findings also have implications for educational equity. If standardized patient-based training provides greater benefit to students with average or lower academic performance, its integration into the curriculum may help narrow competence gaps and promote more uniform clinical readiness across cohorts. This is particularly relevant in undergraduate medical education, where the goal is to ensure that all learners achieve a safe and effective level of clinical competence.

Limitations.

This study has several limitations. First, it was conducted at a single medical university; therefore, the results may not be fully generalizable to other educational settings. Differences in curriculum structure, faculty experience, student characteristics and simulation resources may influence the effectiveness of standardized patient-based training [3,4,13,26].

Second, outcomes were assessed shortly after the intervention. The study did not evaluate long-term retention of competencies or transfer of skills to real clinical practice. Further studies are needed to determine whether the observed improvement in OSCE performance is maintained over time [15,19,20].

Third, examination-related anxiety was not assessed using validated psychometric instruments. Emotional responses to standardized patient encounters may influence performance during structured clinical assessment, and the role of affective factors could not be fully evaluated [17,18,24].

Fourth, complete blinding of assessors was not feasible because of the educational nature of the intervention. Examiner calibration, structured checklists and standardized OSCE stations were used to reduce assessment bias, but residual bias cannot be completely excluded [13,14,22].

Finally, the study did not include a cost-effectiveness analysis. Standardized patient-based programs require trained personnel, scenario development, faculty supervision and institutional resources, which may affect scalability and sustainability [8,16,26,27].

Future research should include multicenter studies, longer follow-up, validated measures of learner anxiety and economic evaluation to better assess the long-term effectiveness and practical implementation of standardized patient-based training.

Conclusion.

This randomized comparative educational study showed that standardized patient-based training was associated with significantly better clinical diagnostic performance than traditional didactic and manikin-based instruction, with the greatest benefit observed among students with average or lower baseline academic performance.

The findings support the integration of standardized patients into undergraduate clinical diagnosis training, particularly for improving diagnostic reasoning, communication skills and preparedness for real clinical encounters. A hybrid model combining standardized patient-based and manikin-based simulation may provide a balanced approach to clinical skills education.

Further studies are needed to evaluate long-term skill retention, psychological factors affecting performance and the cost-effectiveness of standardized patient-based programs.

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