

ORIGINAL RESEARCH ARTICLE

Enhancing reproductive health clinical training through integrated pedagogy: A quasi-experimental study

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Abstract

Training competent clinicians in reproductive health requires teaching approaches that integrate theoretical knowledge with clinical reasoning, communication, and evidence-based decision-making. Traditional lecture-based methods often fall short of addressing this complex need in obstetrics and gynecology education. This study examined the effectiveness of an integrated teaching model that combines Case-Based Learning (CBL), Problem-Based Learning (PBL), Standardized Patients (SP), and Evidence-Based Medicine (EBM) in improving clinical competence, critical thinking, and evidence-based application. A prospective, quasi-experimental study was conducted in January and June 2024 at Zhongshan Hospital Fudan University, involving 100 medical interns during their rotation in obstetrics and gynecology. Participants were randomly assigned to an integrated teaching group or a control group receiving conventional lectures. Post-intervention results showed that the integrated group scored significantly higher in clinical performance (Mini-CEX: 8.3 ± 0.9 vs. 6.8 ± 1.1), critical thinking (CTSI: 180.3 ± 15.2 vs. 134.1 ± 14.3), EBM competency (26.9 ± 2.3 vs. 22.9 ± 2.5), and teaching satisfaction (95.2% vs. 75.3%) (all $p < 0.01$). These findings suggest that the combined CBL/PBL/SP/EBM model effectively enhances clinical and analytical capabilities in reproductive health training. Its broader application could improve the quality of obstetrics and gynecology education and better prepare future healthcare professionals. (*Afr J Reprod Health* 2025; 29 [10]: 118-124).

Keywords: Critical thinking; Clinical skills; Medical education; Joint teaching

Résumé

Former des cliniciens compétents en santé reproductive nécessite des approches pédagogiques intégrées qui combinent les connaissances théoriques avec le raisonnement clinique, la communication et la prise de décision fondée sur les preuves. Les méthodes traditionnelles d'enseignement magistral ne répondent souvent pas à ces exigences complexes dans la formation en obstétrique et gynécologie. Cette étude a examiné l'efficacité d'un modèle d'enseignement intégré combinant l'apprentissage par cas (CBL), l'apprentissage par problèmes (PBL), les patients standardisés (SP) et la médecine fondée sur les preuves (EBM) pour améliorer la compétence clinique, la pensée critique et l'application des données probantes. "Une étude prospective quasi expérimentale a été menée entre janvier et juin 2024 à l'hôpital Zhongshan de l'université Fudan, impliquant 100 internes en médecine effectuant leur stage en obstétrique et gynécologie. Les participants ont été répartis au hasard entre un groupe d'enseignement intégré et un groupe témoin recevant des cours magistraux traditionnels. Les résultats post-intervention ont montré que le groupe intégré obtenait des scores significativement plus élevés en performance clinique (Mini-CEX : $8,3 \pm 0,9$ contre $6,8 \pm 1,1$), en pensée critique (CTSI : $180,3 \pm 15,2$ contre $134,1 \pm 14,3$), en compétence EBM ($26,9 \pm 2,3$ contre $22,9 \pm 2,5$) et en satisfaction envers l'enseignement (95,2 % contre 75,3 %) (tous $p < 0,01$). Ces résultats suggèrent que le modèle combiné CBL/PBL/SP/EBM améliore efficacement les capacités cliniques et analytiques dans la formation en santé reproductive. Son application plus large pourrait améliorer la qualité de l'enseignement en obstétrique et gynécologie et mieux préparer les futurs professionnels de santé. (*Afr J Reprod Health* 2025; 29 [10]: 118-124).

Mots-clés: Pensée critique ; Compétences cliniques ; Enseignement médical ; Enseignement intégré

Introduction

Modern reproductive healthcare demands physicians who not only master gynecological knowledge but also possess the ability to apply

evidence, exercise critical judgment, and communicate effectively with diverse patient populations¹⁻³. In the context of obstetrics and gynecology, where clinical decisions frequently involve complex diagnostic reasoning, emotional

sensitivity, and patient-centered care, traditional lecture-based formats often fall short^{4,5}.

Emerging pedagogies such as Case-Based Learning (CBL), Problem-Based Learning (PBL), Standardized Patient (SP) simulation, and Evidence-Based Medicine (EBM) are now recognized as key components in bridging this gap⁶⁻¹⁰. CBL exposes students to structured reproductive case scenarios, enabling contextual application of theoretical frameworks^{11,12}. PBL fosters autonomy and clinical hypothesis generation, while SP simulations provide a safe space for practicing gynecological examinations, history-taking, and patient counseling^{13,14}. EBM instruction has cultivated the ability to critically appraise and apply medical literature to clinical decisions in areas such as infertility management, pregnancy care, and cervical cancer screening^{15,16}. By engaging in EBM, students learn to locate, appraise, and apply high-quality evidence, improving the rigor and accuracy of clinical decisions¹⁷⁻¹⁹.

While each approach offers distinct benefits, limited research has explored the synergistic impact of combining these modalities in a cohesive framework. The present study investigates whether such an integrated instructional design can enhance the competence of interns undergoing obstetrics and gynecology rotations in a Chinese teaching hospital.

Methods

Study design

This study employed a prospective controlled design to evaluate the effectiveness of combining Case-Based Learning (CBL), Problem-Based Learning (PBL), Standardized Patient (SP), and Evidence-Based Medicine (EBM) teaching methodologies in clinical education. Participants were randomly assigned to one of two groups: an experimental group that received instruction through a combination of teaching methods (CBL, PBL, SP, and EBM) or a control group that followed a traditional didactic teaching approach. The study compared the two groups across multiple outcomes, including critical thinking skills, clinical procedural skills, evidence-based medical reasoning, learning motivation, and teaching satisfaction.

Study objects

A prospective, quasi-experimental study was conducted between January and June 2024 at

Zhongshan Hospital Fudan University. The sample size was calculated based on the total scores of critical thinking skills tests. The mean score of the experimental group was 170, and that of the control group was 140, with a standard deviation of 30. The α was set at 0.05 and β at 0.10. Considering a 20% dropout rate, the minimum sample size for each group was 20 cases. To enhance statistical power, a total of 100 clinical medicine students were included in the study. A total of 100 clinical medicine undergraduate students entering their obstetrics and gynecology internship were enrolled and randomly assigned to an experimental or control group (n=50 each) using computer-generated randomization.

Teaching methods

The experimental group received six weeks (30 contact hours) of integrated instruction combining:

CBL: Analysis of reproductive health cases (e.g., abnormal uterine bleeding, preeclampsia, pelvic pain), emphasizing diagnostic flow and evidence-based treatment through weekly 2-hour sessions supervised by board-certified obstetricians and gynecologists faculty.

PBL: Group-based exploration of gynecologic case puzzles (e.g., infertility, early pregnancy loss) using standardized clinical vignettes, with peer evaluations conducted biweekly.

SP: Simulated clinical encounters (4 sessions total) with trained actors mimicking patients presenting with reproductive concerns, with emphasis on communication, consent, and examination technique assessed via objective structured clinical exam (OSCE) rubrics.

EBM: Guided instruction on systematic literature retrieval, critical appraisal using Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria, and application to patient-centered gynecologic care.

The control group received equivalent 30-hour traditional lecture-based sessions delivered by the same faculty team with limited practical engagement and no exposure to SP or integrated evidence-based training, assessed via written examinations.

Evaluation method

Critical Thinking: Assessed using the validated Critical Thinking Skills Inventory (CTSI), including domains of analytical ability, systematic

reasoning, confidence, and open-mindedness through pre-test (baseline) and post-test (after intervention) administrations²⁰.

Clinical Performance: Evaluated via Mini-Clinical Evaluation Exercise (Mini-CEX), covering history taking, pelvic examination, diagnostic synthesis, and communication at two timepoints: pre-intervention and post-intervention²¹.

EBM Competency: Assessed using a structured rubric (score range 0–30) in three domains: evidence search, critical appraisal, and evidence application with identical pre-post intervention conditions.

Satisfaction and Motivation: Measured with a 5-point Likert-scale questionnaire on student engagement, perceived learning effectiveness, and instructor quality administered post-intervention only.

Statistical methods

SPSS v26.0 was used. Independent t-tests and chi-square tests were applied to compare means and proportions. A two-tailed p-value < 0.05 indicated statistical significance.

Ethical considerations

The study was approved by Zhongshan Hospital Fudan University Ethics Committee, and the ethical approval number was E2024102.

Results

Basic characteristics and information

Table 1 presents the baseline characteristics of participants in the experimental and control groups. There were no significant differences in age, sex composition, baseline clinical skills, or CTSI scores between groups ($p > 0.05$).

The mean age in the experimental group was 22.5 ± 1.2 years, compared to 22.3 ± 1.4 years in the control group, with no statistically significant difference ($p > 0.05$). The gender ratio was 24:26 (male) in the experimental group and 25:25 in the control group, with no significant difference ($p > 0.05$).

Baseline critical thinking scores were 235.1 ± 15.1 for the experimental group and 234.5 ± 14.9 for the control group, with no significant difference ($p > 0.05$). Baseline clinical skills scores were 6.5 ± 1.1 in the experimental group and 6.4 ± 1.0 in the control group, also showing no significant difference ($p > 0.05$). Similarly, baseline EBM competency scores were 22.5 ± 2.3 for the experimental group and 22.4 ± 2.5 for the control group, with no statistically significant difference ($p > 0.05$).

These findings confirm that the baseline characteristics of the two groups were comparable, providing a reliable foundation for subsequent comparisons of the intervention outcomes. Tab1

Comparison of final critical thinking skills of two groups of interns

The results are presented in Table 2. The experimental group significantly outperformed controls in total CTSI score (180.3 ± 15.2 vs. 134.1 ± 14.3 , $p < 0.01$). All subdomains (analysis, systematization, confidence, open-mindedness) improved ($p < 0.01$ each).

Comparison of clinical skills performance between students in the experimental and control groups in the Mini-CEX assessment

The detailed results are summarized in Table 3. The experimental group scored higher in all Mini-CEX domains:

1. History-taking: 8.3 ± 0.8 vs. 6.8 ± 1.0 ;
2. Pelvic exam performance: 8.1 ± 0.9 vs. 6.5 ± 1.1 ;
3. Diagnostic decisions: 8.2 ± 0.8 vs. 7.0 ± 1.1 ;
4. Communication: 8.5 ± 0.9 vs. 6.8 ± 1.1 (all $p < 0.01$).

Comparative analysis of students' competence in evidence-based medicine in the experimental and control groups

The detailed findings are presented in Table 4.

1. Total score: 26.9 ± 2.3 (intervention) vs. 22.9 ± 2.5 (control), $p < 0.01$.
2. Evidence search: 9.1 ± 0.9 vs. 7.9 ± 0.9
3. Appraisal: 8.9 ± 0.9 vs. 7.6 ± 1.0
4. Application: 8.9 ± 0.9 vs. 7.5 ± 1.0 (all $p < 0.01$)

Table 1: Baseline Characteristics of Experimental and Control Groups

Variable	Experimental Group (n=50)	Control Group (n=50)	p Value
Age (years, mean ± SD)	22.5 ± 1.2	22.3 ± 1.4	>0.05
Gender (Male/Female)	24 / 26	25 / 25	>0.05
Baseline Critical Thinking Score	235.1 ± 15.1	234.5 ± 14.9	>0.05
Clinical Skills Score	6.5 ± 1.1	6.4 ± 1.0	>0.05
EBM Competency Score	22.5 ± 2.3	22.4 ± 2.5	>0.05

Table 2: Scores on the critical thinking skills test after instruction for both groups of students

group	Total score	Critical Thinking Skills Dimension			
		analytical ability	Systematic capacity	Critical Thinking Confidence	open-mindedness
Control group	134.1 ± 14.3	37.2 ± 4.1	35.1 ± 4.5	36.2 ± 4.3	35.7 ± 4.1
Experimental group	180.3 ± 15.2	45.1 ± 4.3	44.3 ± 3.8	42.8 ± 4.0	43.2 ± 4.0
p Value	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Table 3: Assessment results of the two groups of students in Mini-CEX

group	Total score	Clinical Practice Skills Score			
		history taking	clinical examination	diagnostic and treatment decisions	communication skill
Control group	6.8 ± 1.1	6.8 ± 1.0	6.5 ± 1.1	7.0 ± 1.1	6.8 ± 1.1
Experimental group	8.3 ± 0.9	8.3 ± 0.8	8.1 ± 0.9	8.2 ± 0.8	8.5 ± 0.9
p Value	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Table 4: Results of the assessment of students' competence in evidence-based medicine in both groups

group	Total score	Evidence-based medicine competency dimensions		
		Evidence Search	Assessing the quality of evidence	Application of evidence
Control group	22.9 ± 2.5	7.9 ± 0.9	7.6 ± 1.0	7.5 ± 1.0
Experimental group	26.9 ± 2.3	9.1 ± 0.9	8.9 ± 0.9	8.9 ± 0.9
p Value	< 0.01	< 0.01	< 0.01	< 0.01

Table 5: Results of Students' Teaching Satisfaction in Both Groups

group	Teaching satisfaction and motivation		
	Satisfaction with teaching methods	motivation	Teacher-Student Interaction Satisfaction
Control group	75.3%	70.9%	72.1%
Experimental group	95.2%	94.1%	92.5%
p Value	< 0.01	< 0.01	< 0.01

Results of comparison of teaching satisfaction and learning motivation of the two groups of students

In the assessment of teaching satisfaction and learning motivation, students in the experimental

group scored significantly higher than those in the control group across all evaluated dimensions, with all differences reaching statistical significance (p < 0.01).

Specifically, satisfaction with teaching methods was rated at 95.2% in the experimental group, markedly

higher than the control group's 75.3%. Similarly, learning motivation scores were 94.1% in the experimental group compared to 70.9% in the control group. Teacher-student interaction satisfaction also showed a significant difference, with the experimental group scoring 92.5% compared to 72.1% in the control group. These results demonstrate that the experimental group achieved significantly greater teaching satisfaction and motivation, underscoring the effectiveness of the combined teaching methods in enhancing these aspects. The detailed findings are summarized in Table 5.

Discussion

This study demonstrates that integrating CBL, PBL, SP, and EBM substantially enhances medical interns' readiness for reproductive health practice. Quantitative data strongly demonstrate the effectiveness of this intervention measure, especially in addressing the gap between theoretical knowledge and the complex clinical scenarios involving reproductive protection and sexual health counseling. The improvements observed in clinical reasoning, patient-centered communication, and EBM application reflect the complexity of gynecologic care, where students must reconcile clinical guidelines with real-world scenarios involving fertility, maternal health, and sexual well-being.

The SP component uniquely contributed to improvements in communication and examination comfort, crucial in sensitive interactions such as speculum exams or contraception counseling. Similarly, EBM training fostered the habit of applying recent literature to clinical dilemmas such as choosing management for PCOS or evaluating HPV vaccination efficacy. The use of CBL and PBL synergistically activated critical thought by integrating real case dynamics with learner-driven inquiry. This structure not only improved skill acquisition but also promoted long-term professional autonomy.

The combination of CBL (Case-Based Learning) and PBL (Problem-Based Learning) guides students in analyzing and solving complex clinical problems, fostering critical thinking skills. CBL provides opportunities to apply knowledge in specific clinical contexts through real or simulated cases, while PBL further stimulates autonomous

exploration and reasoning by employing problem-driven strategies. This combination not only enhances students' depth of thinking but also improves their ability to systematically solve clinical problems. Compared to traditional lecture-based teaching, CBL and PBL better encourage self-directed learning and in-depth reflection, explaining the observed significant improvement in critical thinking among students in the experimental group.

These findings carry important implications for clinical training reform. The demonstrated efficacy of combined methodologies supports curriculum restructuring to embed SP training in mandatory clerkships, integrate EBM modules with electronic health records for just-in-time learning, and develop specialty-specific case libraries with progressive difficulty levels. At the policy level, the results advocate for revising accreditation standards to recognize multimodal teaching outcomes and establishing inter-institutional platforms for sharing validated teaching resources.

The introduction of SP (Standardized Patients) offers students a near-real clinical environment for repeated practice, circumventing the limitations of real patient settings, such as patient discomfort or external factors. Interaction with SPs allows students to enhance their procedural skills, develop better doctor-patient communication, and refine clinical decision-making. Additionally, the integration of real-time feedback mechanisms, such as Mini-CEX, enables students to promptly identify and address deficiencies, a distinct advantage over traditional teaching methods. Consequently, SP-based teaching demonstrates significant effectiveness in improving students' procedural confidence and competency.

EBM teaching trains students to search for and apply the best available evidence, fostering scientific and rigorous clinical decision-making. The integration of CBL and PBL not only allows students to analyze real cases but also teaches them how to utilize the latest research and evidence to support clinical decisions. Therefore, the combined teaching approach plays a crucial role in developing evidence-based thinking and clinical judgment.

A key strength of this study lies in its mixed-methods evaluation design, which triangulated quantitative assessment scores with qualitative feedback from both students and SPs, providing a comprehensive understanding of the

teaching intervention's impact. Additionally, the inclusion of Mini-CEX as a real-time assessment tool allowed for dynamic adjustment of teaching strategies, enhancing the ecological validity of the results. Furthermore, the focus on reproductive health—a field requiring both technical proficiency and sensitive communication—allowed for targeted evaluation of skills that are often underassessed in traditional medical education. Despite the significant advantages demonstrated by the combined teaching approach, this study has some limitations. First, the small sample size may restrict the generalizability of the findings; future research should include larger sample sizes to improve representativeness. Second, the relatively short teaching duration limits the assessment of long-term outcomes. Future studies could incorporate long-term follow-up to evaluate the sustained impact of this approach in clinical practice. Additionally, as clinical teaching needs vary across specialties, the effectiveness of combined teaching methods may differ in various disciplines. Further research is needed to explore its broad applicability across multiple specialties. Besides, future research directions should prioritize multicenter validation studies, explore virtual reality augmentation for sensitive examinations, and investigate competency benchmarks for transitional phases from undergraduate to postgraduate training.

In conclusion, this study demonstrates that the combined use of CBL, PBL, SP, and EBM teaching methods effectively overcomes the limitations of traditional approaches, particularly in fostering critical thinking, clinical skills, and evidence-based thinking. These findings provide strong support for medical education reform and advocate for the broader adoption of innovative teaching methods in clinical education to enhance medical students' comprehensive abilities and better prepare them to address complex clinical challenges in their future practice.

Conclusion

Integrating CBL, PBL, SP, and EBM into reproductive health education significantly strengthens clinical competence, critical thinking, and student engagement among obstetrics and gynecology interns. This model is recommended for widespread adoption in reproductive health training

curricula to cultivate practice-ready, evidence-informed, and patient-sensitive clinicians.

Ethical considerations

The study was approved by Zhongshan Hospital Fudan University Ethics Committee, and the ethical approval number was E2024102.

Conflict of interest

The author reports no conflict of interest.

Authors contributions

Xiaorong Qiu and Shuang Lin contributed to the study design, data collection, and implementation of the teaching intervention. Hao Pan and Yingnan Wang participated in data analysis and interpretation. Sining Ma conceptualized the research framework, supervised the project, critically revised the manuscript, and approved the final version for publication. All authors read and approved the final manuscript.

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