ISSN 2618-1584 Vol. 7, Issue 4: 72-76, DOI: 10.25236/FMSR.2025.070409

The Application Value of CBL Combined with Tiered Training in the Standardized Residency Training of Urology

Yang Kehao[1,a], Zeng Yiming[1,b], Li Yuanwei[2,c,*]

[1]A Graduate Student of Urology, the First Affiliated Hospital of Hunan Normal University, Changsha, China
[2]Director of the Department of Urology, the First Affiliated Hospital of Hunan Normal University, Changsha, 410000, China
[a]1940691416@qq.com, [b]1184528436@qq.com, [c]liyuanwei@hunnu.edu.cn
[*]Corresponding author

Abstract: *To explore the application value of CBL combined with stratified training in the teaching reform of standardized training for resident physicians in urology, a total of 40 residents undergoing standardized residency training in the Department of Urology at Hunan Provincial People's Hospital from September 2019 to September 2022 were selected as the study subjects. They were randomly divided into an experimental group (n=20) and a control group (n=20). The experimental group adopted the "CBL combined with tiered training" teaching method, while the control group used the traditional teaching method. After the training, the teaching effectiveness of the two groups was evaluated through final exam scores, mini-CEX scores, and satisfaction questionnaires. The experimental group scored higher than the control group in both practical skills and theoretical exams, with statistically significant differences (P < 0.05). At the end of the training, the mini-CEX scores of the experimental group were higher than those at the beginning, showing a statistically significant difference (P < 0.05). The mini-CEX scores of the experimental group were also higher than those of the control group at the end of the training, with a statistically significant difference (P < 0.05). Additionally, the satisfaction survey scores of the experimental group were higher than those of the control group, with a statistically significant difference (P < 0.05). CBL combined with tiered training helps improve the quality of urology residency training and enhances the subjective initiative of residents, making it worthy of promotion.*

Keywords: *CBL Teaching; Tiered Training; Standardized Residency Training*

1. Introduction

The content and standards of standardized residency training (2022 edition) for the first time clearly summarized the training objectives into six core competencies. The fundamental goal is to cultivate high-quality medical professionals who are patient- and population health-centered and competent in clinical and preventive work[1] Under the current standards for resident training, the country requires residents who possess both doctor-patient communication skills and the ability to integrate theory with practice. Due to China's aging population and the high number of patients in major hospitals, assigning cases of varying difficulty levels to residents with mismatched capabilities may not only affect patient outcomes but also impose immense work pressure on residents. Training centered on case complexity and tiered residency training based on cases is an area lacking in China's residency training system.

Urology is an important medical discipline, but its complexity, diversity, and specificity, along with limitations in teaching methods and resources, pose numerous challenges to medical education. To optimize the training quality of students in this discipline, the use of CBL—an emerging educational tool-combined with tiered training and feedback through mini-CEX and student satisfaction surveys holds great promise. CBL is a case-based teaching method that requires students to independently solve problems and make decisions[2] In the context of medical education, it plays a crucial role in cultivating students' clinical reasoning, problem-solving abilities, and the capacity to apply theoretical knowledge to real-world medical scenarios. The theoretical foundations of CBL in constructivism, problem-based learning, and experiential learning align with the core principles of medical education. It provides a teaching approach that enables future medical professionals to think critically, solve problems

ISSN 2618-1584 Vol. 7, Issue 4: 72-76, DOI: 10.25236/FMSR.2025.070409

effectively, and deliver patient-centered care. Tiered training involves designing different training plans based on the varying seniority and capabilities of residents. In the current medical education model, it helps enhance residents' clinical learning interest, reduce clinical work pressure, and maximize the quality of residency training. The mini-clinical evaluation exercise (mini-CEX) is a scientific, stable, and easy-to-use assessment tool that can quickly and standardly evaluate residents' clinical abilities and achieve the goal of improving teaching effectiveness and satisfaction through bidirectional feedback[3-4]

Given the specificity of urology, integrating these teaching methods and evaluating their effectiveness is of great significance in addressing the shortcomings of urology residency training. This study aims to combine CBL with tiered training, using mini-CEX and student satisfaction feedback to assess training outcomes and improve the quality of urology residency training.

2. Methodology

2.1 Participants

The study enrolled resident physicians undergoing standardized training in urology from September 2023 to August 2024, with inclusion criteria: voluntary participation. Exclusion criteria: participants who withdrew midway or declined participation. Participants were divided into two groups based on training models: control group (n=20) and experimental group (n=20). Clinical data analysis showed no statistically significant differences between the two groups. The clinical instructors for resident physicians' standardized training at our hospital were selected through hospital-wide screening and had at least three years of clinical experience as attending physicians. All instructors participated in either hospital-level faculty training or provincial-level or higher professional development programs.

2.2 Research Tools

Teaching effectiveness was evaluated using final exam scores (theory + practical), mini-CEX assessments (on the first day of training and at the end of training), and resident satisfaction surveys. The theoretical exam questions were provided by the Department of Urology, and papers were graded immediately after the exam. The practical exam was conducted in the ward, with proctors scoring based on the urology practical exam scoring sheet. Teaching satisfaction was assessed using a self-designed questionnaire with three options: satisfied, somewhat satisfied, and dissatisfied. Teaching satisfaction (%) = (number of satisfied + somewhat satisfied) / total number × 100%.

The mini-CEX evaluation indicators for residents were based on the "Standardized Residency Training Mini-CEX Assessment Guidelines (2022 edition)" and included seven items: medical interview, physical examination, communication skills, clinical judgment, humanistic care, organizational efficiency, and overall performance. Each item was scored out of 9, with results divided into three levels: 1–3 (fail), 4–6 (pass), and 7–9 (excellent)[10] Assessments were conducted by instructors proficient in mini-CEX standards, with each evaluation lasting about 15 minutes[5-6]

2.3 Methods

The control group adopted the traditional training model, which followed the requirements of the "Standardized Residency Training Implementation Measures." Teaching focused on common urological diseases, with knowledge lectures, clinical rounds, and practical operations as the main teaching methods, supplemented by difficult case discussions and expert lectures.

The experimental group implemented a tiered training model with the following specific measures:

Tiered Training

After departmental orientation, residents were divided into first-, second-, and third-year groups based on their enrollment time. Differentiated tiered training was applied. Cases such as kidney/ureteral stones, renal cysts, benign prostatic hyperplasia, prostate cancer, and bladder tumors were used as entry points. Cases were scored based on age and the number of comorbid conditions (Table 1) and divided into low, medium, and high difficulty levels (Table 2). First-year residents managed low-difficulty cases, second-year residents managed medium-difficulty cases, and third-year residents managed high-difficulty cases. Residents were responsible for the entire case management process, with supervising physicians reviewing medical records and orders.

ISSN 2618-1584 Vol. 7, Issue 4: 72-76, DOI: 10.25236/FMSR.2025.070409

Table 1 Scoring cases based on age and the number of comorbid conditions

Score	0	1	2	3
Age	≤45	>45&≤65	>65&≤75	>75
Comorbidities	0	1	2	≥3

Table 2 Case difficulty levels based on scores

	Low	Medium	High
Score	≤2	3-4	≥5

2.4 Statistical Methods

SPSS 27.0 was used for statistical analysis. Exam scores and mini-CEX scores were expressed as ($\bar{x} \pm s$) and analyzed using t-tests. Teaching satisfaction was expressed as (%) and analyzed using χ^2 tests. A P-value < 0.05 was considered statistically significant.

3. Results

3.1 Comparison of Final Exam Scores between the Experimental and Control Groups

As shown in Table 3, the final exam included theoretical and practical scores, with each scored out of 100. The experimental group's average scores in both theoretical and practical exams were higher than those of the control group, with statistically significant differences (P < 0.01).

Table 3 Comparison of final exam scores between the experimental and control groups (points, $\bar{x} \pm s$)

Group	Experimental (n=20)	Control (n=20)	t-value	P-value
Theory	86.75±4.745	81.85±5.050	3.162	0.003
Practical	87.80±4.658	80.85±5.081	4.444	<0.001

3.2 Comparison of Mini-CEX Scores between the Experimental and Control Groups

As shown in Table 4, there were no statistically significant differences in mini-CEX scores between the two groups at the beginning of the training (P > 0.05). However, at the end of the training, the mini-CEX scores of the experimental group were significantly higher than those of the control group (P < 0.01).

Table 4 Comparison of mini-CEX scores between the experimental and control groups at the beginning and end of training (points, $\bar{x} \pm s$)

Group	Comparison of mini-CEX scores between the two groups				Comparison of two groups of mini-CEX scores at discharge			
	Experimental (n=20)	Control (n=20)	t-value	P-value	Experimental (n=20)	Control (n=20)	t-value	P-value
Medical interview	5.30±0.801	5.05±0.394	1.252	0.221	8.25±0.639	5.55±0.887	11.047	<0.001
Physical Examination	5.05±1.146	4.85±0.933	0.605	0.549	8.00±0.795	6.10±0.968	6.785	<0.001
Humanistic Care	4.85±0.813	5.00±1.124	-0.484	0.631	8.20±0.768	6.25±0.786	7.935	<0.001
Clinical Judgment	4.90±1.165	4.65±0.988	0.732	0.469	8.20±0.768	6.30±0.979	6.831	<0.001
Consultation Ability	5.30±1.081	4.60±1.095	2.034	0.049	8.10±0.788	6.05±1.468	5.502	<0.001
Organization Al ability	5.30±1.218	5.10±1.119	0.541	0.592	7.95±0.510	6.15±1.226	6.062	<0.001
Overall clinical ability	5.65±0.671	5.45±0.510	1.061	0.295	8.05±0.394	6.80±0.696	6.991	<0.001

As shown in Table 5, the scores of interview skills, physical examination, humanistic care, clinical judgment, consultation ability, organizational ability and overall clinical ability assessment of the experimental group were better than those at the time of admission, and the differences were statistically significant (P<0.05).

ISSN 2618-1584 Vol. 7, Issue 4: 72-76, DOI: 10.25236/FMSR.2025.070409

Table 5 Comparison of in-and-out department mini-CEX scores between experimental group and control group (score, x±s).

Group	Comparison of in-and-out-of-room mini-CEX scores in the experimental group				Comparison of mini-CEX scores before and after admission in the control group			
	In department (n=20)	Out department (n=20)	t-value	P-value	In department (n=20)	Out department (n=20)	t-value	P-value
Medical interview	5.30±0.801	8.25±0.639	-12.875	<0.001	5.05±0.394	5.55±0.887	-2.304	0.029
Physical Examination	5.05±1.146	8.00±0.795	-9.460	<0.001	4.85±0.933	6.10±0.968	-4.158	<0.001
Humanistic Care	4.85±0.813	8.20±0.768	-13.400	<0.001	5.00±1.124	6.25±0.786	-4.075	<0.001
Clinical Judgment	4.90±1.165	8.20±0.768	-10.576	<0.001	4.65±0.988	6.30±0.979	-5.306	<0.001
Consultation Ability	5.30±1.081	8.10±0.788	-9.361	<0.001	4.60±1.095	6.05±1.468	-3.540	<0.001
Organizational ability	5.30±1.218	7.95±0.510	-8.972	<0.001	5.10±1.119	6.15±1.226	-2.829	0.07
Overall clinical ability	5.65±0.671	8.05±0.394	-13.769	<0.001	5.45±0.510	6.80±0.696	-6.996	<0.001

3.3 Comparison of Teaching Satisfaction between the Two Groups

As shown in Table 6, the experimental group had higher satisfaction than the control group in self-directed learning, theoretical knowledge mastery, clinical diagnostic thinking, and teaching model approval, with statistically significant differences ($P < 0.05$).

Table 6 Comparison of teaching satisfaction between the two groups

Questionnaire items	Experimental (n=20)	Control (n=20)	χ^2	P-value
Self-directed learning	18	9	7.293	0.007
Theoretical knowledge mastery	17	10	4.103	0.043
Clinical diagnostic thinkin	17	9	5.385	0.020
Teaching model approval	19	12	5.161	0.023

4. Discussion

With the rapid development of China's economy and the increasing aging population, demands for medical environments and quality are rising. Consequently, the country has vigorously reformed medical education, introducing the standardized residency training program. This training is an essential path for all medical students to become qualified clinical physicians.

Urology is a highly specialized field in clinical medicine, with a broad and complex scope but relatively limited teaching time. In undergraduate medical education, clinical practice is not widely emphasized, leading to superficial understanding of knowledge and significant teaching challenges. Unfortunately, the role of urology in undergraduate medical education is declining globally, often limited to those who actively pursue it[7] Therefore, during residency training, urology education faces immense pressure, with greater emphasis on practical skills and clinical reasoning. As urology educators, it is our responsibility to maximize medical students' learning efficiency through limited yet impactful methods.

Currently, there is no fixed training model for urology residency training, and various teaching methods have been reported[8-9]

This study implemented CBL-based tiered training, which can meet the learning needs of residents from different specialties. For example, general practice students can manage common cases such as urinary tract infections and stones to fulfill their learning requirements. The tiered teaching method emphasizes interaction and collaboration between instructors and residents, fostering communication and teamwork while cultivating professionalism. Additionally, it provides personalized teaching plans based on residents' actual conditions and learning needs, thereby enhancing motivation and satisfaction while reducing work pressure[10]

The mini-CEX results of this study showed no statistically significant differences between the experimental and control groups at the beginning of the training. However, at the end of the training, the mini-CEX scores of the experimental group were significantly higher, and resident satisfaction was also significantly higher. These findings suggest that CBL-based tiered training is a valuable approach for urology residency training.

ISSN 2618-1584 Vol. 7, Issue 4: 72-76, DOI: 10.25236/FMSR.2025.070409

Acknowledgements

Project of Hunan Provincial Health Commission in 2023 (No. D202304057410)

References

[1] Chinese Medical Doctor Association. "Standardized Residency Training Content and Standards (2022 Edition)" [EB/OL] (2022-08-05) [2022-09-05] http://www.gsysxh.com/a/xinwen/tongzhigonggao/20220806/709.html.
[2] Zhao W, He L, Deng W, et al. The effectiveness of combining problem-based learning (PBL) and case-based learning (CBL) in clinical thyroid disease internship teaching[J]. BMC Med Educ. 2020; 20(1): 381.
[3] Zhang J, Li Y, Deng Y, et al. Evaluation of PBL teaching effectiveness in breast cancer imaging based on the MDT concept[J] Chinese Journal of Medical Education Research, 2018, 17(09):920-924.
[4] Li X, Yang X, Cui Q, et al. The impact of mini-CEX on medical students' competency[J] China Continuing Medical Education, 2022, 14(14):94-97.
[5] Yu G, Xiang Y, Qi J, et al. Interpretation of the "Standardized Residency Training Mini-CEX Assessment Guidelines (2022 Edition)"[J] Chinese Journal of Graduate Medical Education, 2023, 7(01): 24-28.
[6] Chinese Medical Doctor Association. "Standardized Residency Training Mini-CEX Assessment Guidelines (2022 Edition)" [EB/OL] (2022-11-25) [2022-12-25] https: //www. ccgme-cmda. cn/news/15678/1/article.
[7] Casilla-Lennon M, Motamedinia P. Urology in Undergraduate Medical Education[J] Current Urology Reports, 2019, 20(11).
[8] Liu H, Liu J, Xu Z, et al. The effectiveness of case-based teaching in urology residency training[J] Clinical Research and Practice, 2021, 6(8):181-183, 187.
[9] Li J, Li S, Liu J, et al. Application of case-based three-dimensional teaching combined with clinical guidelines in urology residency training[J] China Continuing Medical Education, 2023, 15(22):67-71.
[10] Kong Y, Wang P, Yuan S, et al. Application and exploration of multimodal tiered teaching in ultrasound residency training[J] Health Friends, 2024, (3):136-138.