ISSN 2522-6398 Vol. 5, Issue 17: 60-64, DOI: 10.25236/FER.2022.051711

Application and Impact Assessment of Case-based Learning in the Standardized Training of Urology Residents

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Abstract: *Objective To understand the application and impact assessment of case-based learning (CBL) in the standardized training of Urology residents. Methods A retrospective analysis was carried out on the teaching effect of 76 trainees participated in the standardized training of Urology residents in the First Affiliated Hospital of Nanjing Medical University from September 2018 to December 2020. Among them, there were 37 trainees included before September 2019, and 39 trainees after September 2019, of which the latter part of trainees were classified as the CBL group. Furthermore, the teaching effect was evaluated through the "three basic theory" test and practical skill assessment. Results The average score of theoretical assessment results in the CBL group was significantly higher than that in the traditional teaching group (90.7 ± 4.1vs. 83.6 ± 3.7; P < 0.001). Meanwhile, the average score of skill operation assessment results in the CBL group was also obviously higher than that in the traditional teaching group (75.2 ± 7.5 vs. 65.8 ± 9.6; P < 0.001). Conclusion The application of CBL exhibits positive impact on the standardized training of Urology residents, and greatly improves the trainees' learning interest and learning ability.*

Keywords: *Case-based learning; Standardized training of Urology residents; Urology Surgery*

1. Introduction

Medical education includes three stages: school education, post-graduation education and continuing education. The standardized training of residents is an important stage of lifelong medical education. Since the issuing of the Notice on the Implementation of the Trial Measures for Standardized Training of Clinical Residents by the Ministry of Health in February 1993, standardized training of residents has been performed extensively in many cities across China. It aims to enable trainees to fully master the oretical knowledge and consolidate clinical skills, accomplish the transition from medical students in medical schools to doctors in clinical practice, and provide more available medical talents for grassroots through systematic and standardized learning [1]. Case-based learning (CBL) is a cases-centered, questions-based, students-oriented and teachers-led interactive teaching approach via discussion. CBL is modified from the teaching methodology of problem-based learning (PBL), which conforms to the characteristics of clinical medical education [2]. In order to enable residents to better master the knowledge which is basic and theoretical and clinical skills of Urology Surgery, the present study was performed to preliminarily discuss the application of CBL in the training of Urology residents, associated with corresponding impact assessment.

2. Subjects and Methods

2.1. Subjects of study

A retrospective analysis was carried out on the teaching effect of 76 trainees participated in the standardized training of Urology residents in the First Affiliated Hospital of Nanjing Medical University from September 2018 to December 2020. Among them, there were 37 trainees included before September 2019, and 39 trainees after September 2019, of which the latter part of trainees were classified as the CBL group.

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2.2. Implementation of teaching plan

Before September 2019, the training for residents in our Hospital previously mainly included traditional teaching rounds, special lectures, surgical presentations, etc.

Since September 2019, our Hospital started to introduce the CBL to the resident training in addition to the traditional teaching plan. The main procedures and steps of CBL are described as follows:

Stage I of preview: Prior to small-group discussion, the teacher showed the real-world clinical cases in details vividly through PPT, surgical video and other forms. Trainees were informed to prepare before class and review the knowledge from books, followed by literature review based on the understanding of the basic knowledge of cases to some extent to find out the difficulties and doubts encountered in cases that could be discussed during learning. At the same time, the teacher would prepare the knowledge related to anatomy, pathophysiology, diagnosis and treatment involved in typical cases.

Stage II of small-group discussion: Discussion was considered to be the most crucial part in the process of implementing CBL. The teacher, as the guide of the whole discussion process, controlled the process and direction of the discussion. Firstly, the residents summarized the characteristics of the cases, and showed the basic knowledge of the cases as well as the diagnosis and treatment ideas in combination with books, followed by the assessment and supplementation by the teacher. Secondly, the residents reviewed the case-related literature and reported the latest research progress of the case. Then, the teacher supplemented the content most closely related to diagnosis and treatment according to the clinical practice. Thirdly, the residents proposed questions based on their own understanding of the case, and discussed with each other. The teacher would participate in the discussion, sorted out the results of discussion, redistributed the questions that were still not answered reasonably. The trainees would review the literature after the discussion, communicated and summarized in the next small-group discussion.

Stage III of summary: The teacher summarized and analyzed the diagnosis and treatment of typical cases, and sorted out the knowledge related to the anatomy, pathophysiology, diagnosis and treatment of the case. Meanwhile, the teacher would summarize the discussion and answer the representative questions proposed by the trainees to eliminate knowledge gaps.

2.3. Teaching effect assessment

The teaching effect was assessed and compared based on the examination results, which consisted of two parts, i.e., theoretical assessment and operation skill assessment [3]. The theoretical examination questions were developed on the basis of the "three basic theory" of Urology Surgery, with a total score of 100 points. Skills assessment included two parts: simulated diagnosis and treatment of urological diseases, and specialized operation of Urology Surgery. The teacher played the role of standardized patient (SP) to conduct simulated diagnosis and treatment, and supervised the specialized operation. Specialized operations include retroperitoneal surgery assistance, cystoscopy, circumcision, cystostomy, catheterization, etc. The total score of skill assessment was 100 points.

2.4. Statistical analysis

SPSS 20.0 statistical software was used to analyze the data in our study. The subjective assessment data was expressed by the rate and evaluated by $\chi 2$ test; while the objective test score was presented in the form of $(x \pm s)$ and compared using t test. $P < 0.05$ meant that the difference was statistically significant.

3. Results

3.1. Enrollment of subjects

A total of 76 subjects were enrolled in this study, including 37 cases in the traditional teaching group and 39 cases in the CBL group. Both groups of trainees obtained master's degree and entered the resident training after graduation. There was no significant difference in educational background and clinical work experience.

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3.2. Assessment results of theory and operation skills

As shown in Table 1, trainees in the CBL group had both higher scores of "three basic theory" test and operation skill assessment than those of the traditional teaching group. Specifically, the average score of theoretical assessment results in the CBL group was significantly higher than that in the traditional teaching group (90.7 ± 4.1vs. 83.6 ± 3.7; P < 0.001). Meanwhile, the average score of skill operation assessment results in the CBL group was also obviously higher than that in the traditional teaching group (75.2 ± 7.5 vs. 65.8 ± 9.6; P < 0.001).

Table 1: Assessment results of theory and operation skills of the two groups of trainees

	CBL group (n = 39) (points, x ± s)	traditional teaching group (n = 37) (points, x ± s)	P value
Theoretical assessment	90.7 ± 4.1	83.6 ± 3.7	<0.001
Skill operation assessment	75.2 ± 7.5	65.8 ± 9.6	<0.001

4. Discussion

Resident training is an inevitable stage for the development of each resident. Good training will lay an important foundation for the medical career of residents in the future. Residents in the rotation have certain particularity compared with interns in medical schools and non-degree students seeking advanced training. Firstly, residents have a certain understanding of theoretical knowledge after years of basic theoretical study in common medical schools, yet with non-enough accuracy and breadth of professional knowledge, especially the ability to integrate theories with clinical practice. Secondly, the students participated in the training have a certain professional direction in the postgraduate stage, showing great variation in their knowledge of each specialty in the rotation. During this period, the primary task of each trainee is to combine theories with clinical practice, increase the accuracy and breadth of professional knowledge, and improve the understanding and application of professional knowledge. Furthermore, the training effect has an intimate association with the guidance program of the superior physician [4]. Traditional resident training mode is developed mainly from the experience of interns in medical schools, without considering the particularity of the trainers. It emphasizes the discipline as the basis, the teacher as the center, and the lecture as the main part. Despite a systematical and comprehensive teaching of the theoretical knowledge, it cannot mobilize the enthusiasm of students for learning and independent thinking, leading to limited teaching effect [4,5].

The teaching methodology of CBL, originated in the 1920s, initially achieved good results in the teaching of business management. It received a widespread attention in the field of education and training in the 1980s, and then was promoted in medical, legal and management education and training [6]. In recent decades, the application of CBL has made some progresses in medical education in many Centers and disciplines in China. Its implementation generally includes the selection of teaching cases by the teacher, preview by the trainees voluntarily, small-group discussion and concentrated discussion, and finally summary by the teacher or group representative. For the training of residents, the approach of CBL caters to the development stage of trainees. Firstly, the application of CBL enables trainees to deal with problems in clinical practice directly. The differences between practical problems and knowledge from books to varying degrees stimulate trainees' interest in learning and greatly improve their learning initiative. Secondly, through this method, it creates an active atmosphere of discussion, encourages trainees to think independently, and enables residents to express their opinions freely [7]. During the discussion, the young trainees can compare with each other to establish a positive competition, which further improves the learning effect. Finally, the cultivation of scientific research ability is increasingly important for a qualified doctor. In order to prepare for lessons, trainees need to review numerous related literature and reference materials. While broadening relevant knowledge, trainees can improve their self-learning ability, which is of great significance to the improvement of scientific research ability [8].

Urology has its own particularity compared with other disciplines. The scope of diseases of Urology Surgery involves multiple anatomical levels such as the abdominal cavity, retroperitoneal cavity and subcutaneous structure, covering three systems of endocrinology, urology and reproduction, and involving laparoscopy, natural orifice endoscopic surgery, laser and other techniques. Therefore, the teaching experience of Urology Surgery may provide significant referential value for other disciplines. This study compared the learning effect of applying CBL with those of traditional teaching in residents who rotated in one stage in the Department of Urology. According to the results, the residents who applied CBL were superior to those who applied traditional teaching in both theoretical knowledge and practical skills.

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The core of CBL program is the presentation of cases, which are generally selected by teachers that should be representative and typical. Considering the time constraint of residents trained in the Department of Urology, the key lies in how to make trainees better master relevant knowledge in the limited time. It is necessary for teachers to reasonably select cases. While ensuring the selection of basic typical cases, targeted improvement shall be realized according to the training specialty of trainees. For trainees in the direction of General Surgery, abdominal surgery can be a good choice of case presentation for ability improvement during the training.

Small-group discussion is the key of CBL. During the discussion, it is important for the teacher to mobilize the enthusiasm of the trainees and encourage residents to express their opinions actively. Owing to the differences in professional ability in the postgraduate stage, there may be a great variation in each student's understanding of Urology Surgery. Some trainees think that they have inadequate understanding about problems, and are often shy of expressing their own views and proposing their own questions. In this situation, teachers should actively guide and encourage trainees during training. Meanwhile, the discussion may be beyond the scope of knowledge of the trainees in the process. For residents with limited time of learning, too complicated exploration is not conducive to their grasping of comprehensive knowledge of Urology Surgery. Therefore, teachers must reasonably control the breadth and depth of the discussion in the process.

Attaching importance to practice is the biggest difference between resident training and classroom teaching. Residents who just graduated from graduate schools are seriously lack of practical skills. The training on practical operations related to the Department of the rotation in teaching will further enhance the learning interest and improve learning efficiency of the trainees, such as allowing residents to cooperate in surgery, completing cystoscopy under the guidance of a superior doctor, etc. It may contribute to an intuitive experience of the diagnosis and treatment process of urological diseases in clinical practice.

In addition to enhancing the teaching effect, the implementation of CBL can improve the self-learning ability of trainees [9]. In the process of addressing problems, trainees can review relevant reference materials independently and are able to develop the capability of autonomous learning by using the information resources around them. Consequently, trainees can overcome their dependence on teachers, and actively digest and flexibly apply new knowledge in the process of addressing problems. Collectively, the development of learning capabilities can make trainees benefit from the improvement of endoscopic ability, and will be of great advantage for further development in the future.

Without doubt, there are some limitations in CBL at present, among which effort- and time-consuming are the representativeness [10]. At present, the training of residents is carried out generally by large-scale hospitals where the teachers and trainees have to bear a huge amount of clinical work during their working hours. Due to the introduction of CBL, teachers and trainees have to spend an enormous amount of time and effort on literature review, thinking and discussion after work. Consequently, the trainees may have no time to think seriously in their heavy clinical work, but just mechanically complete the tasks assigned by their superiors frequently, which affects the training effect to a certain extent.

To sum up, the clinical training practice for Urology residents in our study supports that the application of CBL can significantly improve the training effect, which is worthy of further promotion clinically.

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