

Application of CBL Teaching Method Combined with Situational Simulation Teaching in Clinical Teaching of Anesthesiology and Its Influence on Improving Theoretical Knowledge and Clinical Practice Ability of Anesthesiology Medical Students

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Objective. To analyze the application of case based learning (CBL) teaching method combined with situational simulation teaching in clinical teaching of anesthesiology and its influence on improving theoretical knowledge and clinical practice ability of anesthesiology medical students. **Methods.** 42 anesthesiology medical students who came to our hospital for internship from March 2019 to March 2020 were selected as the research objects, and were randomly divided into the study group and the reference group, with 21 students in each group. The CBL teaching method combined with situational simulation teaching was adopted for the study group, while the traditional teaching mode was adopted for the reference group. After the teaching, both groups of students were assessed in theory and skill operation, and the scores were compared. **Results.** There was no significant difference in gender ratio, average age, only-child or not, home address and aspiration to choose this major between the two groups ($P>0.05$). After training, the scores of theory test and skill operation in both groups were significantly higher than those before training ($P<0.001$), and the scores in the study group were significantly higher than those in the reference group ($P<0.001$). The scores of fill-in-the-blank questions, noun explanations and essay questions of the study group were significantly higher than those of the reference group ($P<0.001$). The study group was better than the reference group in deepening learning and memory, improving autonomous learning ability, stimulating learning interest, and cultivating clinical thinking ($P<0.05$). The scores of professional practical ability, professional attitude, management ability, interpersonal communication ability, professional development ability, and critical thinking ability in the study group were significantly higher than those in the reference group ($P<0.05$). After training, the humanistic care ability scores of both groups were significantly higher than those before training ($P<0.001$), and the score in the study group was significantly higher than that in the reference group ($P<0.001$). The total recognition of the study group was significantly higher than that of the reference group ($P<0.05$). **Conclusion.** CBL teaching method combined with situational simulation teaching can significantly improve students' mastery of theoretical knowledge and practical operation of clinical anesthesiology, and stimulate their humanistic care consciousness, which can lay the foundation for cultivating professional talents of anesthesiology in our hospital.

Key words: case based learning (CBL) teaching method; situational simulation teaching; clinical teaching of anesthesiology; theoretical knowledge; clinical practice ability

Clinical anesthesiology is an important branch of medicine, which requires students not only to fully master the enormous knowledge of internal medicine, surgery and emergency medicine, but also to have strong hands-on ability. Therefore, only practicing and operating over and over again can truly meet the clinical needs^[1-2]. However, there are many problems in the current anesthesia teaching, such as the separation of theory and practice, and the lack of students' theoretical thinking. So the traditional anesthesia teaching mode can no longer meet the current needs. Case based learning (CBL) based on real clinical cases can effectively kindle students' enthusiasm for autonomous learning, while situational simulation teaching can cultivate their ability to find and solve problems. The combination of the two can achieve better teaching effect^[3-5]. Based on this, this study aims to further explore the application effect of CBL teaching method combined with situational simulation teaching in clinical teaching of anesthesiology and its influence on improving students' theoretical knowledge and clinical practice ability. This study is summarized as follows.

MATERIALS AND METHODS

General Data

42 anesthesiology medical students who came to our hospital for internship from March 2019 to March 2020 were selected as the research objects, and were randomly divided into the study group and the reference group, with 21 students in each group. The intern students were informed of the purpose and methods of this study and signed the informed consent after entering the department.

Methods

The reference group received the traditional teaching mode, including theoretical teaching, practical teaching, practice guidance and examination^[6].

The study group received CBL teaching method combined with situational simulation teaching, with the detailed implementation steps as follows. The typical cases of anaesthesia department were combined to simulate on-the-

spot teaching and conduct analysis theory teaching. The instructors provided guidance and comments to students, and taught them examination methods. Medical dummy was used in the simulation teaching. ① Establishment of professional education groups. CBL teaching groups were composed of backbone teachers from anesthesia department of teaching and research in our hospital^[7-8]. ② Selection of cases. The cases suitable for the clinical teaching were selected according to the difficulty level of what the first-year intern students learned. In order to ensure that the anesthetic knowledge related to selected cases could completely include emphases and difficulties of the learned chapters, and was worthy of discussion, the cases should be repeatedly deliberated and carefully designed, with their authenticity and integrity remained. Finally, the standard teaching cases were designed. ③ Implementation of teaching. One week before formal courses, the instructors should tell students the standard cases suitable for clinical anesthesia teaching, make preparation for classes, guide them to learn the content in advance and inform them of pre-designed questions that needed to be discussed in class. The students studied in groups in clinical anesthesia teaching. They were encouraged to completely review the anesthesia knowledge related to the cases, record the difficulties encountered in their study, query relevant information to learn independently on the problems encountered, discuss with each other within the group, and express their personal opinions and ideas^[9-11]. The students should also find out the problems and solutions related to the standard cases and make a report based on the research results in the form of PowerPoint or written report. In formal courses, with the combination use of medical dummy, the students' mastery of complex clinical anesthesia operation such as deep venous catheterization and use of laryngoscope was evaluated and assessed. The students' reaction in situational simulation was observed to assess their clinical strain and disease observation ability. In addition, their emergency handling ability was assessed through simulation exercise^[12-13].

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Evaluation Indexes

After training, the instructors examined students on the teaching contents and handed out questionnaires about teaching achievement evaluation, which were in the form of closed-book examination (theory) and skill operation (objective), including fill-in-the-blank questions, noun explanations and essay questions, with a full score of 50 points for each item. The same assessment standard was adopted, and the instructors did not participate in marking the test papers.

The *Student Self-evaluation Questionnaire* designed by the department was used to evaluate the evaluation of the two groups on their self-learning achievements, including deepening learning and memory, improving autonomous learning ability, stimulating learning interest, and cultivating clinical thinking.

The scoring system was used to assess the core competence of both groups, including professional practical ability (20 points), professional attitude (15 points), management ability (20 points), interpersonal communication ability (10 points), professional development ability (20 points), and critical thinking ability (15 points), with a total score of 100 points.

The humanistic care ability of both groups before and after training was assessed by Ma Yulian's revised Chinese version of *Humanistic Care Ability Scale*^[14], including cognition, patience and courage. The full score of cognition was 100 points, and patience and courage was 70

points each, so the total score was 240 points. The higher the score, the better the humanistic care ability of students.

After training, anonymous questionnaire was used to assess the recognition of teaching mode in both groups. It can be divided into four standards: strongly like, like, neither like nor dislike, and dislike. Total recognition = rate of strongly like + rate of like + rate of neither like nor dislike.

Statistic Methods

The experimental data were statistically analyzed and processed by SPSS21.0 software, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was used to draw pictures of the data. The count data were tested by χ^2 test, and described by [n (%)]. The measurement data were tested by t test, and described by ($\bar{x} \pm s$). $P < 0.05$ indicated that the difference had statistical significance.

RESULTS

Comparison of General Data between the Two Groups

There was no significant difference in gender ratio, average age, only-child or not, home address and aspiration to choose this major between the two groups ($P > 0.05$), which was suitable for the comparative study. See Table 1.

Table 1
Comparison of general data between the two groups

Items	Study group(n=21)	Reference group (n=21)	χ^2/t	P
Gender			0.096	0.757
Female	12 (57.14%)	11 (52.38%)		
Male	9 (42.86%)	10 (47.62%)		
Average age (years old)	21.54 \pm 1.35	21.48 \pm 1.42	0.140	0.889
Only child			0.104	0.747
Yes	13 (61.90%)	14 (66.67%)		
No	8 (38.10%)	7 (33.33%)		
Home address			0.104	0.747
Towns and cities	14 (66.67%)	13 (61.90%)		
Countryside	7 (33.33%)	8 (38.10%)		
Aspiration to choose this major (%)			0.141	0.707
Voluntary choice	16 (76.19%)	17 (80.95%)		
Involuntary choice	5 (23.81)	4 (19.05%)		

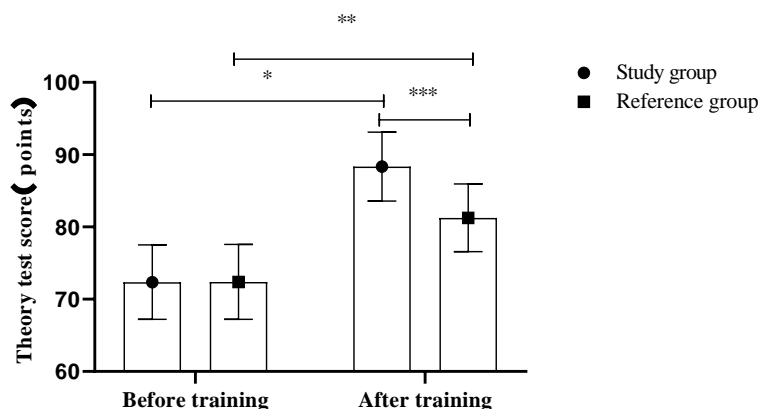
Comparison of Scores of Theory Test and Skill

Operation before and after Training between the Two Groups

After training, the scores of theory test and skill operation in both groups were significantly higher than those before training ($P<0.05$), and

the scores in the study group were significantly higher than those in the reference group ($P<0.05$). See Figures 1-2.

Figure 1
Comparison of theory test scores before and after training between the two groups ($\bar{x}\pm s$, points)



Note: The horizontal axis from left to right represented before training and after training, and the vertical axis represented theory test score (points).

In the study group, the theory test scores before and after training were (72.36±5.14) and (88.36±4.76) respectively.

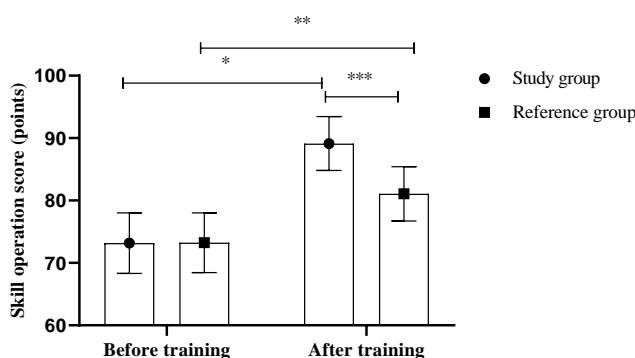
In the reference group, the theory test scores before and after training were (72.39±5.19) and (81.26±4.69) respectively.

* indicated that there was a significant difference in the theory test scores before and after training in the study group ($t=10.466$, $P=0.000$).

** indicated that there was a significant difference in the theory test scores before and after training in the reference group ($t=5.811$, $P=0.000$).

*** indicated that there was a significant difference in the theory test scores between the two groups after training ($t=4.869$, $P=0.000$).

Figure 2
Comparison of skill operation scores before and after training between the two groups ($\bar{x}\pm s$, points)



Note: The horizontal axis from left to right represented before training and after training, and the vertical axis represented skill operation score (points).

In the study group, the skill operation scores before and after training were (73.17±4.86) and (88.36±4.76) respectively.

In the reference group, the skill operation scores before and after training were (73.24±4.78) and (81.07±4.35) respectively.

* indicated that there was a significant difference in the skill operation scores before and after training in the study group ($t=11.259$, $P=0.000$).

** indicated that there was a significant difference in the skill operation scores before and after training

Application of CBL Teaching Method Combined with Situational Simulation Teaching in Clinical Teaching of Anesthesiology and Its Influence on Improving Theoretical Knowledge and Clinical Practice Ability of Anesthesiology Medical Students in the reference group ($t=5.552$, $P=0.000$).

*** indicated that there was a significant difference in the skill operation scores between the two groups after training ($t=6.032$, $P=0.000$).

Comparison of Scores of Various Questions between the Two Groups

The scores of fill-in-the-blank questions, noun

explanations and essay questions of the study group were significantly higher than those of the reference group ($P<0.05$), as shown in Table 2.

Table 2
Comparison of scores of various questions between the two groups ($\bar{x}\pm s$, points)

Items	n	Fill-in-the-blank questions	Noun explanations	Essay questions
Study group	21	43.26 \pm 3.25	46.23 \pm 3.22	43.52 \pm 3.51
Reference group	21	36.54 \pm 3.17	35.96 \pm 3.45	36.37 \pm 3.72
t		6.783	9.973	6.406
P		0.000	0.000	0.000

Comparison of the Self-evaluation Questionnaire Results between the Two Groups

The results of student questionnaire survey showed that the study group was better than the

reference group in deepening learning and memory, improving autonomous learning ability, stimulating learning interest, and cultivating clinical thinking ($P<0.05$), as shown in Table 3.

Table 3
Comparison of the self-evaluation questionnaire results between the two groups [n (%)]

Questionnaire contents	Study group (n=21)			Reference group (n=21)			X^2	P
	Yes	No	%	Yes	No	%		
Deepening learning and memory	19	2	90.48	13	8	61.90	4.725	0.030
Improving autonomous learning ability	20	1	95.24	14	7	66.67	5.559	0.018
Stimulating learning interest	18	3	85.71	12	9	57.14	4.200	0.040
Cultivating clinical thinking	19	2	90.48	13	8	61.90	4.725	0.030

Comparison of the Core Competence Scores between the Two Groups

The scores of professional practical ability, professional attitude, management ability, interpersonal communication ability, professional

development ability, and critical thinking ability in the study group were significantly higher than those in the reference group ($P<0.05$), as shown in Table 4.

Table 4 Comparison of the core competence scores between the two groups ($\bar{x}\pm s$, points)

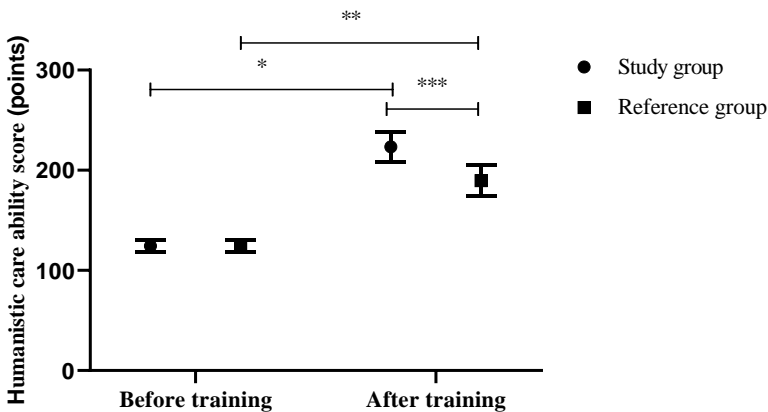
Items	Study group (n=21)	Reference group (n=21)	t	P
Professional practical ability	15.35±1.43	9.23±1.24	14.817	0.000
Professional attitude	12.11±1.24	7.42±1.25	12.207	0.000
Management ability	15.63±2.14	9.83±1.86	9.374	0.000
Interpersonal communication ability	6.22±1.52	4.31±1.63	3.927	0.000
Professional development ability	16.25±2.42	10.24±1.42	9.816	0.000
Critical thinking ability	10.59±2.18	8.21±2.24	3.489	0.001

Comparison of Humanistic Care Ability Scores between the Two Groups before and after Training

Aftertraining, the humanistic care ability

scores of both groups were significantly higher than those before training ($P<0.05$), and the score in the study group was significantly higher than that in the reference group ($P<0.05$). See Figure 3.

Figure 3
Comparison of humanistic care ability scores between the two groups before and after training ($\bar{x}\pm s$, points)



Note: The horizontal axis from left to right represented before training and after training, and the vertical axis represented humanistic care ability score (points).

In the study group, the humanistic care ability scoresbefore and after training were (124.35±6.23) and (223.26±15.43) respectively.

In the reference group, the humanistic care ability scores before and after training were (124.47±6.19) and (189.62±15.64) respectively.

* indicated that there was a significant difference in the humanistic care ability scores before and after training in the study group ($t=27.239$, $P=0.000$).

** indicated that there was a significant difference in the humanistic care ability scores before and after training in the reference group ($t=17.750$, $P=0.000$).

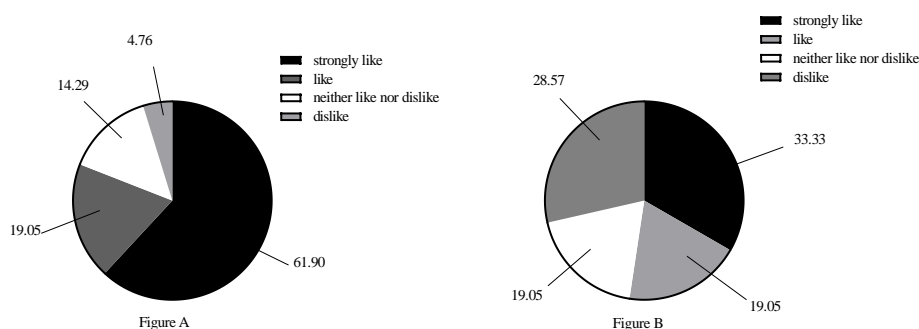
*** indicated that there was a significant difference in the humanistic care ability scores between the two groups after training ($t=7.017$, $P=0.000$).

Comparison of the Recognition of Teaching Mode between the Two Groups

The total recognition in the study group was

significantly higher than that in the reference group ($P<0.05$), as shown in Figure 4.

Figure 4
Comparison of the recognition of teaching mode between the two groups [n (%)]



Note: Figure A and Figure B respectively represented the recognition degree of teaching mode of students in the study group and the reference group (%). Among them, the black area represented strongly like, dark gray area represented like, white area represented neither like nor dislike, and light gray area represented dislike.

In the study group, the proportions of strongly like, like, neither like nor dislike and dislike were 61.90% (13/21), 19.05% (4/21), 14.29% (3/21) and 4.76% (1/21) respectively.

In the reference group, the proportions of strongly like, like, neither like nor dislike and dislike were 33.33% (7/21), 19.05% (4/21), 19.05% (4/21) and 28.57% (6/21) respectively.

There was a significant difference in the total recognition between the two groups ($X^2=4.286$, $P=0.038$)

DISCUSSION

The goal of training anesthesiology medical students is to cultivate anesthesiologists who possess rich professional knowledge of anesthesia, relevant humanities knowledge and quick reaction ability, and can master all kinds of clinical anesthesia skills. During the

four-year study in the university, the students have mastered a certain amount of theoretical knowledge of anesthesia. How to better cultivate students' clinical thinking ability, combine the knowledge they've learned with clinical practice, and make a better transition from students to doctors is an important issue in the clinical teaching of anesthesiology^[15-16]. The traditional teaching mode is mainly based on classroom teaching and teachers' reading and writing on the blackboard. As a result, the learning process is boring and students' classroom participation is not high, and they can not grasp the anesthesia knowledge well. In addition, a survey has found that under the traditional teaching mode, students can not really understand what they have learned, often cope with examinations by rote learning, and lack flexible application of theoretical knowledge of anesthesia. Therefore, in the era of continuous development of medical education and rapid update of medical knowledge, the traditional anesthesia teaching mode has been unable to meet the needs of contemporary medical students. So it is necessary to explore new teaching modes of anesthesiology^[17-18]. The clinical practice stage of anesthesiology medical students in the 5th academic year is an important stage to

comprehensively exercise their hands-on ability, discover and analyze problems, and combine theory with clinical practice. So it is an important part of the whole process of anesthesia teaching^[19-20]. Due to the lack of protection of relevant laws and policies, many teachers dare not allow intern students to operate. In addition, with the enhancement of patients' self-preservation consciousness, most patients refuse the operation of intern students. Thus, the students lack practical opportunities, which will lead to the fact that their learning enthusiasm is dampened, their clinical thinking ability can not be improved and the expected training goal can not be achieved when they graduate^[21].

The CBL teaching mode is to use relevant basic knowledge to summarize and analyze specific clinical cases, combine theory with practice, and improve the clinical thinking ability of medical students. It is an important mode in clinical medical teaching^[22]. Anesthesiology teaching is difficult because anesthesiology is a quite professional subject, with strong practicality, abstract knowledge and boring teaching process. CBL teaching mode can solve the above teaching problems to make students better understand and master anesthesia knowledge. The situational simulation teaching mode can better combine the knowledge learned in the classroom with actual work, effectively solve the problems that theoretical knowledge is difficult to vividly explain, and effectively solve the problems of insufficient resources and few practical opportunities in clinical practice^[23-24]. The situational simulation teaching can combine the boring theoretical knowledge of anesthesia with

clinical practice, and indirectly cultivate students' clinical thinking ability through simulation and demonstration of anaesthetic methods and problems encountered in the operation process of different cases. This study showed that the scores of theory test and skill operation in the study group after training were significantly higher than those in the reference group ($P < 0.001$), indicating that the combination of the two could enable students to better master relevant theories and hands-on ability of anesthesiology. In addition, CBL combined with situational simulation teaching mode has significantly improved students' core competence. It is speculated that in this study, students in the study group can use medical dummy, need to formulate a detailed implementation plan of anesthesia before anesthesia, and can get the instructors' comments and answers, so their anesthesia knowledge is expanded in depth and breadth. Decamp et al.^[25] found in their study that under the teaching mode of narrative medicine combined with CBL, students' professional core competence score (87.62 ± 4.32) in oncology was significantly higher than that under the traditional teaching mode (74.23 ± 4.28), indicating that CBL teaching mode could significantly improve the professional core competence of medical students and lay a solid foundation for training professional talents in hospitals.

In conclusion, CBL combined with situational simulation teaching mode can enable students to better master the theoretical knowledge of anesthesia, improve their practical operation ability, and stimulate the humanistic care for patients, which is worthy of application and promotion in teaching.

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