

# Application of operational simulation training system in the training of ophthalmic students

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## 手术模拟教学在眼科学学生培养中的应用

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### 摘要

**目的:**探讨手术模拟教学在眼科学学生培养中的作用。

**方法:**将 2009/2011 在中国医科大学眼科学系就学的学生 480 名作为研究对象并随机分为 2 组,试验组采用手术模拟教学联合传统教学的方法,对照组只采用传统教学方法,半年后对两组学生的临床基本技能进行考核。

**结果:**不同组别研究生的眼科基本显微镜下操作、缝合技术考核成绩、对手术技术的信心均有显著性差异。实施手术模拟教学后学生的临床基本技能掌握程度明显提高,且对各自的手术技术充满信心。

**结论:**手术模拟教学对提高研究生学生的临床基本技能具有重要作用。

**关键词:**手术模拟教学;医学教育;眼科学学生

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### Abstract

• **AIM:** To assess the impact of the operational simulation training system on the cultivation of ophthalmic students.

• **METHODS:** Four hundred and eighty ophthalmic students in China Medical University from 2009 to 2011 were chosen as objects and divided into two groups at random. The students in the experimental group used operation simulation training system combined with traditional teaching methods, while the students in the control group only used traditional teaching methods. We examined the operation skills and the confidence of all the students half a year later.

• **RESULTS:** The improvement of the operation skills during the suture technique examination, and the confidence for operation technology were significantly different in two groups. The basic skills of the students in the examination groups improved apparently during the operational simulation training and they were full of confidence to their operational technique.

• **CONCLUSION:** The operational simulation training is useful for promoting the clinical ability for ophthalmic students and should be widely popularized.

• **KEYWORDS:** operational simulation training; medical education; ophthalmic students

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### INTRODUCTION

Clinical medicine was a practical science. Clinical training was an important step in the process of medical education. It was the bridge combining medical theory with clinical practice. It was also an important element to train qualified clinicians. Operational skills training was one of the main tasks of clinical training. In the traditional teaching mode, students learned clinical knowledge under the guidance of the superior doctor. Firstly, students learned the principle of the operation and the theory of medicine. Secondly, they observed the operation, and learned the steps. When they were very familiar with the process of the operation, they could begin to do the operation step by step under the guidance of the instructor. This was the main training method in the most of the Department of Ophthalmology at present. As the doctor - patient contradiction was more and more outstanding in recent years, opportunities for the clinical training were increasingly limited, which became an obstacle to cultivate qualified clinicians. With the continuous development of computer technology, operational simulation training system was developed. Endoscope virtual simulation training system was widely used in the United States. Respiratory physicians took more than 500000 cases of bronchoscopic examination by the system each year. Microsurgical operation simulation training in the Department of Ophthalmology was also paid more and more attention. But to date, there was no statistical evidence to support this training mode. In this study, simulated training system were

provided for the ophthalmic students and we made a scientific conclusion by a series of data analysis.

## SUBJECTS AND METHODS

**Subjects** Four hundred and eighty ophthalmic students were chosen as the objects from 2009 to 2011 in China Medical University after informed consent was given. The ratio of male to female was 1.09:1 (no statistical significance). The age range was from 19 to 23y.

**Methods** Four hundred and eighty ophthalmic students were involved in this study and divided into two groups, the experimental group and the control group. The students in the control group used traditional teaching methods. Firstly, students learned principle of the operation and the theory of medicine. Secondly, they observed the operation, and learn the steps. When they were very familiar with the process of the operation, they could begin to do the operation step by step by the guidance of the superior doctors. The students in the experimental group used the traditional teaching methods, combined with operational simulating training once a week. All the students took a series of examination for clinical skills half a year later.

**Assessment Methods** The assessment for the clinical skills was divided into two parts: cases analysis and operation skills. Each one had fifty points. Each student was examined by three instructors. Each problem was thoroughly referenced and the average score of the three examiners was taken as the result.

**Equipment** Operational simulating training system (EYESI, Germany).

**Questionnaires** The confidence of the ophthalmic students was accessed by a questionnaires according to the previous article.

**Statistical Analysis** Differences between the two groups were compared with SPSS 17.0 statistics software by using the Chi-square test.  $P < 0.05$  was selected as the significance standard.

## RESULTS

Table 1 showed the results of the test. It showed that the number of students whom took the score over eighty in the experimental group was significantly higher than that in the control group. The difference was statistically significant ( $P < 0.05$ ).

Table 2 listed the main parts of the questionnaire for the students. Most of the students in the control group acknowledged that they could not solve many problems during the training and also could not gain enough confidence from the traditional training while the students in the experimental group did not have the same difficulties.

The operational simulation training is useful for promoting the clinical ability for ophthalmic students and should be widely popularized.

## DISCUSSION

The announcement of “global minimum essential requirements in medical education” (GMER) produced profound impact on the medical education in 2002. The education mode needed to

**Table 1 Comparison of the scores between the two groups**

Groups	>80 (%)	70-79 (%)	<69 (%)
Experimental group	104 (43)	86 (36)	50 (21)
Control group	52 (22)	110(46)	78 (32)

$\chi^2 = 26.40$ ;  $P < 0.05$ .

be transformed and the teaching effect needed to be enhanced<sup>[1]</sup>. GMER showed the basic qualities of the medical students in Medical Colleges around the world, including medical knowledge, clinical skills, occupational attitudes, behavior and morality and so on<sup>[2]</sup>. Basic clinical skills was the core in GMER. Medical students could not become experienced clinicians without enough clinical skills training. According to the research, more and more students registered for the examination on medicine in recent years<sup>[3]</sup>. But the clinical teaching resources did not increased. Although “licensed physicians law”, “measures dealing with medical accidents” and other laws and regulations were established in China, there was still no clear legal status for interns. Patients also complained for the clinical training because they felt like the guinea pigs. In a word, the resources for the clinical skills training were more and more insufficient.

Microsurgical operational training was a very important step for ophthalmic students. The ophthalmic students passed many exams and had a perfect theoretical basis. But they could not master the operational skills for lacking of exercise. In the traditional culture, especially in the beginning stages, the interns and their instructors were equally full of pressure. Most of the operation was treated in microscope. The space was too small. It was not easy to control the learner's operation. A slight mistake might cause severe damage to the patient. Medical stimulating training was a newly developed technology<sup>[4]</sup>. It was designed to create a authentic and safe environment and used by the students to do the operation training without any pressure. After this training, the students could go into the actual operation training stage smoothly.

Microscopic operation simulator was a precise instrument which was a computer equipped with a simulated eye<sup>[5-6]</sup>. The program of the simulator was designed to pay attention to standardize the basic operation training<sup>[7]</sup>. For the beginners, stability and accuracy training were the main task. The training of glaucoma and cataract simulated operation would be the advanced stage. Students would not be allowed to do any operation for the patients until mastering the basic skills.

The greatest advantage of medical simulation education was that students could do practice repeatedly. Different courses were designed for students with different levels and students could make training plan according to their time. The system could record the training results for evaluation. It would help the students to find their problems during the operation. The function of playback was also very helpful<sup>[8]</sup>. Students often focused on the steps during the operation, while ignoring the injury of the peripheral tissue. For example, they focused on the suture and ignored the damage of the corneal by the tweezers.

**Table 2 Questionnaire: Confidence of the students in the two groups**

Variable	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	group <sup>1 (2)</sup>	group <sup>1 (2)</sup>	group <sup>1 (2)</sup>	group <sup>1 (2)</sup>	group <sup>1 (2)</sup>
The learning method achieved our goals for clinical skills	143 (89)	49 (120)	36 (15)	12 (16)	0 (0)
The learning method was effective	202 (156)	16 (37)	22 (45)	0 (2)	0 (0)
I accomplished complete understanding the training method	133 (145)	65 (88)	42 (7)	0 (0)	0 (0)
I would like to repeat the experience	138 (95)	44 (26)	30 (81)	16 (20)	12 (18)
I got enough confidence to meet the patients	236 (67)	4 (102)	0 (36)	0 (35)	0 (0)
I could solve patient-related problems by the end of the training	131 (143)	25 (38)	28 (20)	54 (37)	2 (2)
I remember more from the training	139 (124)	62 (68)	39 (48)	0 (0)	0 (0)
The system explored deeper discuss and identified learning needs	95 (68)	102 (42)	32 (72)	11 (58)	0 (0)
The system could not explored deeper discuss and identified learning needs	0 (0)	18 (56)	40 (77)	94 (33)	88 (74)
The system helped students understand their strengths and weaknesses	144 (87)	82 (76)	12 (57)	2 (18)	0 (2)
The system could not help students understand their strengths and weaknesses	0 (0)	1 (5)	9 (62)	105 (73)	125 (100)

<sup>1</sup>The experimental group; <sup>2</sup>The control group. (Qin *et al.* PBL in large Class Stomatology Course. J Oral Maxillofac Surg 2010).

They made excessive force toward the eye. These things might cause some complications. During the playback, the problems could be found. Students would continue to make progress in the practice<sup>[9]</sup>.

Medical simulation education did well on the whole, with much more to be improved<sup>[10]</sup>. It could not simulate all the clinical courses. Communication could be obtained between the doctor and patients. The students were able to observe the various reaction from the patients during the real operation<sup>[11]</sup>. But it could not get from the simulator. There was still a long distance between simulation training and real operation training<sup>[12]</sup>.

Simulation training would become an inevitable trend to the development of medical education<sup>[13-16]</sup>. Simulation teaching changed the traditional teaching mode. It provided a vivid and safe environment to improve clinical skills. It could also create an environment for creative thinking and decrease medical accidents and disputes in the clinical education<sup>[17-20]</sup>. In this study, we could see that the students tested high in the exam after being trained in the operational simulation training system and they were full of confidence to their clinical technique. We could draw a conclusion that operational simulation training was effective for the students to improve the operational technology and confidence building. It should be promoted widely. Solid theoretical knowledge combination with operational simulation training, patients training under the guidance would be the best way for the cultivation of ophthalmic students.

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