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## New Mode of Clinical Basic Skills Training of Internal Medicine Based on Translational Science

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### Abstract

**Purpose:** To develop a new mode of clinical basic skills training of internal medicine for undergraduates based on the translational science ideas. **Methods:** We selected 42 students and 44 students in different grade as observation group and control group, respectively. Observation group was received virtual simulation and clinical practice interactive teaching mode; while control group was taught by the traditional methods. The difference of clinical basic skills scores of internal medicine between these two methods were compared. In addition, 'Questionnaire for Practical Teaching Efficiency of Internal Medicine' was filled in by two groups and was analyzed after the course. **Results:** The scores of theory examination of internal medicine part I and part II were increased in the observation group. **Conclusion:** Construction of the new modes for clinical basic skills of internal medicine based on translational science can improve the clinical ability of medical undergraduates, and eventually enhance students' comprehensive professional quality.

### Keywords

Translational science (TS), undergraduate, simulation-based medical education (SBME), clinical basic skills, internal medicine.

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## 1. Introduction

The reform of medication in modern education emphasizes the combination of medical education and clinical skill, thus to avoid disconnection of fundamental studies in translation science (TS), as a new discipline, the relevant research receives more and more recognition in the international medical field since it proposed (Lehmann, Altuwajri, Li, Ball, & Haux, 2008; Leng, 2012); its main purpose is to eliminate the barrier between basic medicine and clinical medicine; it directly applies the result from basic research into clinic, and obtain the effects from clinical application; while determine a new cycle if any problem found in clinical application. It requires the teaching content and layout should always relate to clinical service awareness; which trains the clinical consciousness and ability of the students

with theoretical knowledge; it plays an important role in teaching and practice of the medical students by transform the concept of medicine; thus, TS is a conversion bridge between the basic and clinical medicine. Currently, the clinical skills center of medical colleges is mostly focus on construction of site and hardware but not in teaching hospital; which the clinical training is mainly concentrated in laboratory, the training of student in clinical skills are often isolated or separate from clinic. In order to cultivate the talents of transformation medicine, it is imperative to construct a new model of clinical skills training for medical students on the concept of medical transformation.

Medical education research contributes to TS, its outcomes not only impact educational settings, but also downstream results, including better patient-care practices and improved patient outcomes (McCaghie, Issenberg, Cohen, Barsuk, & Wayne, 2012). Simulation-based medical education (SBME), in particular, has demonstrated its role in achieving such distal results. Simulation has long been viewed as an attractive option for medical education because it gives learners an opportunity to practice clinical skills in a low stakes setting (Malangoni, Biester, Jones, Klingensmith, & Lewis, 2013; Schwab, Hungness, Barsness, & McGaghie, 2017).

Undergraduate education plays an important role in personnel training. It is the basic stage of multi-level education system in China (Deng & Fan, 2014). Based on the TS, the diagnosis and internal medicine education are marked; which the education of virtual simulation technology of medical simulation model, bedside in clinic, and clinical practice are highly integrated. The Comprehensive Clinical Skills Training Center in the teaching hospital, had provides an opportunity for this research; which is more conducive in exchange and integration of clinical practice and virtual simulation operations.

The aim of this research is to establish a new type of fundamental clinical training mode for undergraduate medical students; so that the clinical education of internal medicine can be concentrated in teaching hospital; and improve the course arrangement and implement, or elevate the clinical practice effects. During the teaching steps, the teachers have to renew their theory, and closely relate the simulation medical model, virtual simulation technology and bedside teaching in clinic; this will rapidly improve sensibility and rational understanding of the students. And paying attention to cultivating students in doctor-patient communication skills, improve clinical practice, aseptic concept, and adaptability and so on.

## **2. Objects and Methods**

### **2.1 Objects of Study**

A total of 44 undergraduates of five-year clinical medicine, 2008 grade in medical school were chosen to be the control group. 42 undergraduates of five-year clinical medicine in 2010 grade were established as an observation group. In the observation group, the teaching mode was adopted by interacting of virtual simulation system and the clinical practice to develop the transformation method from virtual simulation education to bedside teaching in theoretical and practical courses, totally taking 90 teaching hours. While the control group was taught by traditional teaching mode which was needed 54 teaching hours. The teachers in class and probation, class hour, materials and content were all the same in the two groups.

### **2.2 Teaching Methods**

#### **2.2.1 Observation group**

This group was adopted by interacting of virtual simulation and clinical practice teaching mode and combined the interaction of virtual simulation teaching and clinical practice to abstract the theoretical knowledge from books. It was not only enhancing students' interests to learn, but also raising the students' ability to acquire knowledge and use the knowledge to analyze and solve problems. During the teaching program, certain clinical basic skills were selected as the observation subjects in internal medicine, such as: basic skills of diagnostics, laboratory tests and assistant investigations, diagnostics knowledge exam, theory of internal Medicine I and theory of internal medicine II.

#### **(a) Basic skills of diagnostics**

This part included physical examination (PE) and history taking. During the internship arrangement, it would start with besides teaching and practice the students on those examinations that patients most

cooperated with, such as inspection and auscultation. Practice pulmonary abdominal virtual simulation system of clinical skill center that patients resisted with.

#### (b) Laboratory tests and assistant investigations

During laboratory tests and assistant investigations, ECG analysis and blood and bone marrow cell examination were included. ECG analysis was the teaching emphases and difficulty in diagnosis and internal medicine; theoretical teaching was often difficult for students to understand and master the basic knowledge of clinical electric-cardiology, and common features of normal and abnormal ECG as well in a short time. The teaching of this research was applied a better study in ECG analysis by leading the students' integrating clinical thinking and specific diseases; the students reviewed the patient's condition in the ward, and the supervisor analyzed the case reports in clinic skills training center, then they entered in ECG training and test system to explain the characteristics of the ECG pictures. Meanwhile, our college had established the ECG testing center for further improvement in ECG diagnosis of the students. This also had provided a good learning platform in expanding the related knowledge of arrhythmia diagnosis and treatment. Students could browse and learning the characteristic of typical abnormal ECG pattern, and estimate ECG results at the same time by "tele-ECG center" after classes. Besides, in the study of hematological diseases after the diagnosis course, it was combined with the case report, the student had to review the patient's condition and back to clinic skills center, to check the blood cell and bone marrow cell results of the patient from bone marrow cell graphic analysis system; so that students could combine theoretical knowledge with clinic case, and avoid the separation of laboratory teaching from clinical teaching.

#### (c) Theoretical Examination

Students had to take theoretical exams after finishing the courses of diagnostics, internal medicine I and II. The content of basic skills of diagnostics including: clinical basic skills and diagnostics. While, internal medicine I including: respiratory system, cardiovascular system, urinary system, and poisoning. In addition, internal medicine II includes: digestive system, hematology system, endocrine system, and rheumatic diseases.

#### 2.2.2 Control group

This group accepted the traditional teaching model. After completion of theoretical studies, the students practiced in clinical skills training center or basic skills in laboratory contract; and then went to the ward after qualified.

### 2.3 Questionnaire

After competing all theoretical and trainee courses of internal medicine, a total of 80 students in both groups were required to complete the "Feedback Form of Medical Practice". The content of the questionnaire could mainly reflect students' mastery of the basic skills in diagnosis and internal medicine, and also suggest teaching mode of internal medicine. The control group and observation group were sent 44 and 42 copies of questionnaires, respectively. And the recovery rates were 100%.

## 3. Evaluation Method of teaching effect

### 3.1 Basic skills assessment of internal medicine between the two groups.

Compared the assessment results of the two groups respectively on basic skills of diagnostics, laboratory tests and assistant investigations, diagnostics knowledge exam, theory of internal medicine I and theory of internal medicine II.

### 3.2 "Feedback Form of Medical Practice" result

A questionnaire survey was applied to reflect the connotation of quality education; the investigation of the questionnaire after the class end. The content of the questionnaire was classified into two parts, such as (1) self-mastery in basic skills of diagnostics and internal medicine; (2) The satisfaction and recommendations to the teaching model of internal medicine.

### 3.3 Statistical Analysis

Applied with Excel form to input data; and statistical analysis in SPSS16.0. The data were expressed as mean ± standard deviation (mean±SD). Applied the independent sample t test to compare the difference between two groups in basic skills of internal medicine.  $P < 0.05$  stands for difference was statistically significant.

## 4. Results

### 4.1 Assessment results of basic skills of internal medicine between two groups

Assessment results were shown in Table 1 and Figure 1. The assessment results of theory of internal medicine I and II were statistically significant ( $P < 0.05$ ) between the control group and observation group. While there was no significant different on basic skills of diagnostics, laboratory tests and assistant investigations and diagnostics knowledge exam ( $P > 0.05$ ) between two groups.

Table 1. Assessment results of basic skills of internal medicine between two groups (mean±SD)

Examination contents	Control Group	Observation Group	t	P
Basic Skills of Diagnostics	82.40±8.34	85.33±5.72	1.94	0.060
Laboratory Tests and Assistant Investigations	71.39±11.79	67.29±11.61	1.64	0.104
Diagnostics Knowledge Exam	75.37±8.78	73.83±9.52	0.79	0.432
Theory of Internal Medicine I	69.19±6.62	73.05±11.64	1.88	0.032*
Theory of Internal Medicine II	74.70±5.16	77.15±6.19	2.00	0.025*

\*:  $P < 0.05$ .

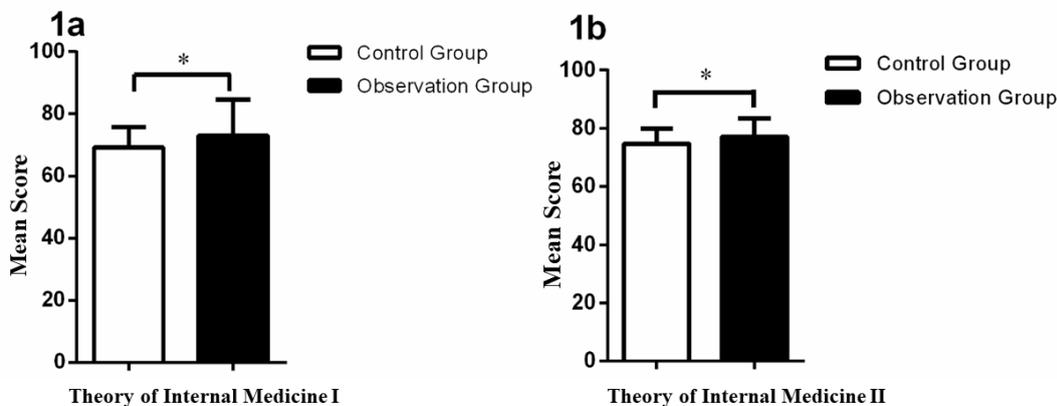


Figure 1. Scores on Theory of Internal Medicine I (1a) and Theory of Internal Medicine II (1b) between two groups.

### 4.2 Feedback of the trainee effects of clinical basic skills in internal medicine

#### 4.2.1 Mastery of basic skills in internal medicine

The students in observation group were capable to master the basic skills of diagnostics, laboratory tests and assistant investigations, diagnostics knowledge exam, theory of internal medicine I and II. Of these, 100% of the students were able to fully master the basic skills of diagnostics, diagnostics knowledge exam and internal medicine I in observation group. But in the control group, the master degrees of skills above were generally lower than the observation group (Table 2).

#### 4.2.2 Suggestion and Satisfaction in teaching mode of internal medicine

The survey showed that 39 students (98%) in observation group felt satisfied with interactive teaching model of virtual simulation and clinical practice; while there were 27 students (61%) in control group felt satisfied with the traditional teaching mode.

Table 2. Feedback of the mastery of clinical basic skills in internal medicine

Evaluation Indicators	Control Group			Observation Group		
	good command	Basic command	Unable to command	good command	Basic command	Unable to command
Basic Skills of Diagnostics	15	27	2	30	12	0
Laboratory Tests and Assistant Investigations	16	26	2	25	15	2
Diagnostics Knowledge Exam	23	20	1	31	11	0
Theory of Internal Medicine I	24	19	1	25	16	1
Theory of Internal Medicine II	20	21	3	27	15	0

## 5. Discussion

### 5.1 The significance of clinical basic skills training of internal medicine based on TS

The present situation of cultivating the medical students is the isolation between clinical skills training with clinical practice. So that students cannot change their role quickly in the ward after class in medical school; they are unable to apply the knowledge in theory and laboratory or clinical training room into clinical practice. Especially the application of clinical skills of internal medicine; due to lack of effective conversion of basic knowledge and clinical practice, the students are lack of guide “from laboratory to beside(Bench to bedside B2B)”; not to mention “from ward back to laboratory, and solve clinical problems with scientific research”, and so on. Such a single training mode, applies a lack of continuity in systems of the subject; and the deficiency in the ability to solve problems of clinical practice, are unable to adapt to the rapid development of advance medical level. Therefore, the introduction of TS in the education model can help to improve the above problems.

### 5.2 Applying virtual simulation experiment teaching as an opportunity to construct the transformation medical platform

Simulation of medical education model is a new model of education that is being implemented in the international education community is a bridge between class and clinical practice (Schmidt, Goldhaber-Fiebert, Ho, & McDonald, 2013; Zendejas et al., 2011). This approach provides the opportunity of students to think independently and verify the accuracy of the diagnosis directly; that cause no harm to the patients, feels reality and no limitation of time. In 2005, our school had established the first medical simulation demonstrating center in South China; after years of development, the comprehensive training center for clinical skills of our school became a provincial demonstrating center in 2013. In recent years, medical laboratory operation and practical teaching system constantly renewed, as the developing of modern information technology; which brought up the development and opportunity or motivation with challenge to the education reform. The new experimental teaching method of virtual simulation laboratory is a teaching mode that highly reforms the real situation, simulation teaching environment and content. The virtual simulation experiment teaching center of clinical medicine has established in our school through resource integration. It provides an advance and flexible environment for the students to fill in gaps along the traditional medical experiment teaching. The traditional teaching mode could complement and promote by virtual simulation practice repeatedly.

The core of TS research is to establish effective communication between the researcher in basic science and the doctors who understand the needs of patients. The equipment and instructions of virtual simulation experiment teaching had operated in the teaching of this research; for example the self study software of tele-ECG in ECG analysis, and simulation system of ECG analysis; the simulation teaching system of cardiopulmonary auscultation、 abdominal palpitation in heart、 lung and abdominal examination; the intramedullary image analysis system in laboratory operation (examination of blood and bone marrow cell) and so on. The clinical skills teaching are close to the real clinic environment by the combination between the TS platform and virtual simulation experiment teaching. It effectively breakthrough the disadvantage of traditional cultivation mode and elevate the chance of practice, that foster the ability and enhance the quality of the students.

### 5.3 Teaching effect

The results of this research showed that the scores in observation group were higher in theory of internal medicine I and II compare to the control group ( $P<0.05$ ). The theoretical assessment of internal medicine I including: respiratory system, cardiovascular system, urinary system, and poisoning. The theoretical assessment of internal medicine II including the digestive system, hematology system, endocrine system and rheumatoid diseases. The theoretical scores of internal medicine I and II were higher in observation group compare with control group. It was indicated that the students could better masters the content of different systems in comprehensive studies, due to the elevate in clinical thinking of the students after improve the teaching mode.

According to the feedback form, majority students in observation group believed a higher mastery to clinical skills of internal medicine; with a high evaluation to the improved teaching mode. This suggested with the guide of TS concept, that the teaching mode of interaction between virtual simulation teaching and clinical practice had a better effect. The reasons are due to the good effect of the TS teaching of internal medicine that improves students' understanding of the theory; enhance the connection between diagnosis and clinical practice of internal medicine by attention to combination of theory with clinical practice; and promote team spirit of cooperation, by cultivate the students' communication ability in different case reports, that a clinical medical worker should have; at the same time, improves the students' capability in self-regulation and creativity. The problems of derailment of theory and practice can well solve in the above functions. Therefore, the improvement of students' quality and achievement of connotation construction in teaching could reflects the quality education of clinical medicine undergraduates.

## 6. Conclusion

In conclusion, the basic clinical skills mode of internal medicine has showed an initial result in undergraduates under the guide of TS; providing a convenient two-way fast lane for the study of clinical subject and clinical application. This virtuous cycle, has formed during the education phase of medicine, will also help medical students develop solid skills in the future career (Zhang, 2011). Although the development of TS is meaningful to the education of medical undergraduates and the development of the whole medical industries, but there is still a long way to practice widely. We should fully understand the connotation of TS; cultivate high quality applied medical talents in enhance TS awareness, integration and cooperation of subjects, and cultivate transform ideas and ability. More people are in need to join to explore and develop together for continuous improvement.

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