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The Practice and Exploration of Applying EBM to Bilingual Teaching of Medical Genetics at OSBCM

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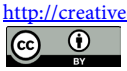

Abstract

In the process of teaching medical genetics of undergraduate clinical medicine, the practice and exploration of applying EBM to the bilingual teaching of OSBCM medical genetics are carried out. Using CBL and PBL as the carrier can make up for the shortcomings of a single teaching mode, synthesize the advantages of multiple teaching modes. It starts from integrating the basic theoretical knowledge of medicine and clinical practice knowledge, improving students' bilingual level of medical genetics, cultivating students' literature retrieval ability, and promoting early clinical, multi-clinical and repeated clinical consciousness for medical students. Therefore, it is more conducive to cultivate students' ability to learn independently, accurately analyze and solve problems, improve medical students' clinical thinking ability and scientific research awareness, improve medical students' ability of international communication, and lay a solid foundation for improving medical students' future post competence, innovative spirit and lifelong learning ability.

Keywords

Medical Genetics, Evidence Based Medicine, Organ-System-Based Curriculum Model, Problem Based Learning, Case-Based Learning

1. Introduction

In 2012, Yangtze University became one of the first batches of pilot universities for the "Five-year Reform of Clinical Medical Professional Talent Training Model" project of the Ministry of Education and the Ministry of Health. Subsequently, our school took the lead in carrying out the reform of the "Organ-System-Based Curriculum Model" (OSBCM) curriculum teaching mode [1] in the undergra-

duate excellence class of clinical medicine. With the rapid development of the Department of Medicine, which is established by the integration of the School of Basic Medicine and the School of Clinical Medicine, medical genetics, as a bridge discipline linking clinical medicine and basic medicine [2], plays a self-evident role in enhancing the clinical practice ability and scientific research ability of clinical medicine undergraduates and promoting their job competency after graduation. The teachers of the Department of Medical Genetics have some practical experience in teaching medical genetics with problem-based learning (PBL) in the excellent class, and have the experience of teaching MBBS international students in English. Since 2015, Medical Genetics has become a bilingual course at Yangtze University, and has been continuously taught to multi-level clinical undergraduates. The construction of this course has always been highly valued and strongly supported by the leaders of the school. The teaching reform of OSBCM in the course of medical genetics adapts to the needs of closely linking basic medical theoretical knowledge with clinical practice knowledge, and applies evidence-based medicine (EBM) [3] to promote the intensive training awareness of early clinical, multi-clinical and repeated clinical training of clinical medical students, so as to improve their clinical thinking ability and scientific research awareness. That is to say, on one hand, the clinical problems need to be solved with the help of scientific research. On the other hand, the purpose of scientific research lies in pushing clinical practice forward. Ultimately, the clinical practice and the scientific research are highly interrelated and mutually reinforced.

2. Reform the Teaching Model of Medical Genetics in Clinical Medicine

In the past, the teaching mode of medical genetics was Lecture Based Learning (LBL). However, the traditional single LBL teaching mode was mainly based on the teacher's cramming of knowledge [4]. Therefore, the passive massive transient memory of knowledge by students not only made it difficult to stimulate students' interest in learning, but also seriously affected the cultivation of students' independent innovation ability. Whereas, Problem Based Learning (PBL) alone, which focuses on students' problem solving, stimulates students' enthusiasm and tends to cultivate students' self-directed learning ability, but it may be constrained by students' low English proficiency and incomplete literature search, which may affect the actual effect [5]. Although case-based learning (CBL) alone focuses on students' analysis of cases and stimulates students' interest and tends to cultivate students' clinical thinking ability [6], it may also be limited by students' low English proficiency and incomplete search results, which affects precision medicine.

3. Construct a New Curriculum System

Medical genetics is a bridge discipline that closely links basic medicine and clinical medicine. And the reform of the "organ system-centered" curriculum model

integrates the teaching of basic medicine with the teaching of clinical medicine, effectively prevents the separation of basic theory and clinical practice, thus meets the disciplinary characteristics of medical genetics and the needs of teaching development as shown in Tables 1-5. The core idea of evidence-based medicine (EBM) is to deliberately, accurately, and judiciously apply the best research evidence available to determine treatment for individual patients. So far, more in-depth research on evidence-based medicine has been carried out in clinical medicine [7], which has effectively cultivated students' clinical thinking ability, but there are no relevant reports on evidence-based medicine teaching and research in medical genetics in China. Relying on the successful approval and implementation of the first batch of national excellent doctor education and training programs "Five-year Reform of Clinical Medicine Professional Talent Training Model" in our university, our school took the lead in carrying out the "organ system-centered" curriculum model reform in the undergraduate excellent class of clinical medicine. In this study, CBL and PBL [8] were used as carriers to apply evidence-based medicine to the bilingual teaching of medical genetics, so as to complete the transformation of students from "what to learn" to "how to learn" and improve students' self-directed learning ability. To a large extent, it makes up for the shortcomings of a single LBL, PBL and CBL teaching mode, which not only stimulates students' interest in learning, but also helps students to retrieve big data information in a larger range and at a deeper level, so as to promote the early contact and early participation of clinical medical undergraduates in clinical research and scientific research, and effectively cultivate students' clinical thinking ability and scientific research ability.

Table 1. The affected organs and systems of the single-gene genetic disorders.

Affected Organs and Systems	Single-Gene Genetic Disorders
Blood Circulatory System	Hemoglobin; hemophilia; Familiar Hypercholesterolemia; Glucose-6-phosphate Dehydrogenase Deficiency
Locomotor system	Duchenne and Becker Muscular Dystrophies; Osteogenesis Imperfecta;
Respiratory System	Cystic Fibrosis;
Urinary System	Cystinuria;
Digestive System	Congenital Glucose/Galactose Malabsorption
Nervous System	Phenylketonuria; Gaucher disease; Tay-Sachs disease

Table 2. The affected organs and systems of the polygenic diseases.

Affected Organs and Systems	Polygenic Diseases
Nervous System	Schizophrenia; Parkinson disease; Alzheimer disease;
Hormonal System	Diabetes mellitus;
Blood Circulatory System	Hypertension;
Respiratory System	Asthma

Table 3. The affected organs and systems of the mitochondrial diseases.

Affected Organs and Systems	Mitochondrial Diseases
Nervous System	Leber optic atrophy; Leigh syndrome;
Locomotor system	Myoclonic epilepsy associated with ragged-red fibers

Table 4. The affected organs and systems of the chromosomal disorders.

Affected Organs and Systems	Chromosomal Disorders
Nervous System	Down syndrome; Edwards syndrome; Patau syndrome;
Circulation System	Down syndrome; Edwards syndrome; Patau syndrome;
Reproductive System	Klinefelter syndrome; Turner syndrome

Table 5. The affected organs and systems of the somatic cell genetic disorders.

Affected Organs and Systems	Somatic Cell Genetic Disorders
Digestive System	Hereditary non-polyposis colon cancer 2;
Nervous System	Neurofibromatosis 1; Neuroblastoma;
Urinary System	Nephroblastoma

The design of applying evidence-based medicine (EBM) to "Organ-System-Based Curriculum Model" (OSBCM) curriculum teaching mode of medical genetics bilingual teaching: In the application of EBM to OSBCM medical genetics bilingual teaching, students use bilingual course materials or courseware to preview the bilingual theoretical knowledge of the course before class, and then discuss and prepare cases and problems in combination with the OSBCM and EBM teaching resources provided by teachers. In class, the teacher introduces the case, raises the questions, guides the students to carry out class discussions, and the students use the materials consulted before class to discuss the cases and problems. Teachers make generalizations, summaries, comments, and inspire students.

4. Implement New Teaching Practices (See Table 6)

The evidence-based medicine was applied to the bilingual teaching of OSBCM medical genetics, and the students were guided to independently preview the bilingual content of medical genetics before class, the teacher selected typical cases and put forward the relevant problems that may arise in the process of diagnosis and treatment, the students were voluntarily divided into groups to solve the problems raised by the teachers by searching for relevant Chinese and English materials and group discussions, and the teachers commented on the solutions of the students in each group to the problems raised, and summarized the difficulties and precautions of teaching knowledge. Relying on CBL and PBL, this model cultivates students' ability to accurately retrieve relevant Chinese and English materials to meet the requirements of precision medicine based on the

Table 6. Implementing new teaching practices.

Procedures of new teaching practices	Details of measures
1) General introduction	Genetics and genomics in medicine; the Human Genome and the Chromosomal Basis of Heredity; Gene Structure and Function of the Human Genome; Methods of Human Molecular Genetics; Principles of Clinical Cytogenetics; Genetic variation in individuals and populations: mutation and polymorphism; Human gene mapping and disease gene identification
2) OSBCM introduction	Genetic disorders; affected organs and systems; Pathogenesis
3) Giving abstracts and papers about Medical Genetics from PubMed	Encourage the students to distinguish the background, aims, methods, discussion, results and conclusion of the abstracts and papers.
4) Raising problems	Encourage the students to implement problem-based learning based on EBM
5) Follow up cases reports	Encourage the students to implement case-based learning based on EBM, including genetic counseling, the diagnosis, treatment of genetic diseases and personalized genetic medicine.

English knowledge of medical genetics and cases and related problems, which is more conducive to the cultivation of students' independent innovation ability, so as to improve students' job competency and lifelong learning ability after graduation.

Scheme for the implementation of EBM in OSBCM Medical Genetics Bilingual Teaching:

4.1. Construct OSBCM and EBM Teaching Resources

Teachers determine the major and difficult points according to the medical genetics syllabus and teaching objectives, compile some case databases of typical genetic diseases, and search and construct extracurricular reference textbooks, clinical guidelines, Chinese and English journal literature, Chinese and English professional websites, Chinese and English professional databases and other teaching resources.

4.2. Pre-Class Preparation

Before class, the teacher selects the corresponding genetic cases according to the teaching plan, and designs questions to prepare for class discussion. Students are given bilingual theoretical knowledge courseware and case studies 2 weeks in advance, and students are guided to prepare for class discussions by consulting OSBCM and EBM teaching resources.

4.3. Classroom Teaching

Teachers introduce genetics cases, raise questions, guide students to discuss based

on important clinical evidence, debate and communicate with each other, and analyze and solve clinical problems from the perspective of decision-makers.

4.4. Summary and Evaluation

The teacher summarizes the teaching content of the case, comments on the students' discussions, and inspires and encourages the students.

The key to applying EBM to OSBCM bilingual teaching of medical genetics: EBM is based on clinical evidence, literature, and large-sample biological information with CBL and PBL, and guides students to identify important information, find out key problems, and analyze the interconnection between important information to solve problems from the perspective of decision-makers. It is an important means to cultivate students' ability to learn the theoretical knowledge of Chinese and English genetics, improve their ability to search for Chinese and English literature, and analyze and solve problems based on clinical evidence.

1) Cultivating students' ability to learn the theoretical knowledge of Chinese and English genetics: The English level of students' genetic professional knowledge is the basis for students to search Chinese and English materials and discover important information in a larger range and at a deeper level.

2) Constructing OSBCM and EBM teaching resources: Various OSBCM and EBM teaching resources are an important guarantee for expanding the scope of Chinese and English data retrieval.

3) Cultivating students' ability to actively use OSBCM and EBM teaching resources for self-directed learning: Students' self-learning ability is the key to students' analysis and problem solving based on clinical evidence.

5. Achieve the Corresponding Goals by Solving the Main Problems

Through the discussion and research on the application of EBM in the bilingual teaching of medical genetics in OSBCM, the teaching methods are improved and the students' multi-faceted abilities are cultivated:

1) Solving the problem of separating basic medical theoretical knowledge and clinical practice is conducive to improving the job competency of medical students after graduation, and accelerating the organic integration and mutual promotion of basic and clinical. Through OSBCM, the integration between basic medical theory and clinical practice is promoted, and students are promoted to have early, multi-clinical and repeated clinical practice, so that basic knowledge and clinical knowledge can be connected and penetrated into each other so as to accelerate the basic to promote clinical progress, clinical to promote the development of the basic.

2) Solving the problems of rote learning, high scores and low ability of medical students, stimulate students' interest in learning, and help cultivate students' ability to analyze and solve problems objectively and accurately using the knowledge they have learned and the ability to learn independently. To cultivate stu-

dents' independent innovation ability, lay a solid foundation for their future clinical practice and scientific research, so as to improve their job competency.

3) To solve the shortcomings of a single teaching model, relying on CBL and PBL, EBM is conducive to cultivating students' logical thinking ability, critical thinking ability, communication ability, lifelong learning ability and realistic spirit, so as to enhance students' ability to find, analyze and solve problems, improve teaching effect and upgrade teaching quality.

6. Conclusion

Aiming at undergraduates majoring in clinical medicine, we took the lead in carrying out the practice and exploration of applying EBM to OSBCM bilingual teaching of medical genetics in medical colleges and universities in the province. It uses CBL and PBL as carriers to make up for the shortcomings of a single teaching mode and synthesize the advantages of multiple teaching modes. As for the advantages by applying EBM to OSBCM bilingual teaching of medical genetics in medical colleges and universities, starting from the integration of basic medical theoretical knowledge and clinical practice knowledge, increasing students' bilingual level of medical genetics, cultivating students' literature retrieval ability, and promoting medical students' early clinical, multi-clinical and repeated clinical awareness, it is more conducive to cultivating students' ability to learn independently, accurately analyze and solve problems, enhance medical students' clinical thinking ability and scientific research awareness, and advance medical students' ability of international communication. In particular, it lays a solid foundation for improving the job competency, innovative spirit and lifelong learning ability of medical students after graduation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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