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Research and Discussion on Flipped Classroom Combined with Case-Based Learning in Pharmacoeconomics Teaching

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Abstract: *Objective:* To explore the application effect of flipped classroom combined with case-based learning teaching methods in pharmacoeconomics teaching. *Methods:* The students majoring in clinical pharmacy in 2019 were selected as the study subjects, and the cost-effectiveness analysis of different dosage forms of Yinzhihuang in the treatment of neonatal jaundice was selected as the teaching case. The flipped classroom combined with case-based learning teaching method was used to carry out theoretical teaching to the students. After the course, questionnaires were distributed through the Sojump platform to evaluate the teaching effect. *Results:* The results of the questionnaire showed that 85.71% of the students believed that the flipped classroom combined with case-based learning teaching method was helpful in mobilizing the learning enthusiasm and initiative, and improving the comprehensive application ability of the knowledge of pharmacoeconomics. 92.86% of the students think that it is conducive to the understanding and memorization of learning content, as well as the cultivation of teamwork, communication, etc. *Conclusion:* Flipped classroom combined with case-based learning teaching method can improve students' knowledge mastery, thinking skills, and practical application skills, as well as optimize and improve teachers' teaching levels.

Keywords: Flipped classroom; Case-based learning teaching method; Pharmacoeconomics; Teaching methods

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1. Introduction

Pharmacoeconomics is a practical discipline at the crossroads of medicine, economics and management, and other multidisciplinary disciplines, which mainly studies the economic effects of drugs, the safety of drugs, and the evaluation of the effectiveness of drugs. Pharmacoeconomics is a compulsory course in the teaching of pharmacy, medicine, public health, and other professions [1]. Teachers of this discipline should have a professional background in health economics and pharmacy, master the summary of teaching experience during the teaching period, and improve their teaching ability through the design of teaching links or effective teaching guidance, so that students can understand the teaching key points and cultivate their ability to think actively during the learning process, which is an important way for teachers to further improve the teaching effect and

ensure the quality of pharmacoeconomics classroom teaching [2].

As pharmacoeconomics has an abstract concept and complex content, students often face difficulty in understanding and mastering the knowledge, and the teaching effect is poor. Flipped classroom is a student-centered teaching mode, whose theoretical basis mainly includes constructivism, cognitive psychology, and social learning theory. Constructivism believes that learning is an active and individualized process, and students should construct their own knowledge system through independent learning, inquiry, and discovery [3]. It transfers traditional lectures to outside the classroom, allowing students to learn independently through online learning platforms, video courses, etc., before class, and devoting classroom time to discussions, interactions, and practices to ensure the quality of classroom teaching [4]. The combined teaching method is a case-based teaching method, which allows students to accumulate sufficient theoretical knowledge through case analysis and discussion to provide a theoretical basis for their future practical work [5].

2. Study subjects and methods

2.1. Study subjects

A total of 14 students, including 6 males and 8 females, from the clinical pharmacy program of the class of 2019 in our hospital were selected for the study. Their average age was 20.12 ± 0.98 years old.

2.2. Research methods

2.2.1. Teaching case

A cost-effectiveness analysis of different dosage forms of Yinzhihuang in the treatment of neonatal jaundice was carried out.

(1) Objective: To compare the cost-effectiveness of the treatment of neonatal jaundice by Yinzhihuang granules and Yinzhihuang injection.

(2) Methods: Patient outcomes and healthcare costs were assessed by comparing the direct, indirect, and hidden costs of treating neonatal jaundice and the adverse drug reactions that occurred with the treatment of neonatal jaundice with Yinzhihuang granules and Yinzhihuang injection.

(3) Results: There was no significant difference in treatment effect between treating neonatal jaundice with Yinzhihuang granules and Yinzhihuang injection ($P > 0.05$). The cost of treatment with Yinzhihuang injection was 2576.41 yuan, while the cost of treatment with Yinzhihuang granules was 2226.37 yuan, saving 350.04 yuan, with improved compliance and reduced incidence of adverse reactions.

(4) Conclusion: The treatment of neonatal jaundice with Yinzhihuang granules is less costly than with Yinzhihuang injection without compromising safety and efficacy [6,7].

2.2.2. Teaching methods

(1) Before class:

(a) The study group was formed, x students were selected as one group {x is the integer divisor of students in the class, usually 3 or 4}, and they communicated through online chat software such as Weibo or QQ.

(b) The teacher selected the case of pharmacoeconomics evaluation for discussion, which was the cost-effectiveness analysis of different dosage forms of Yinzhihuang for treating neonatal jaundice. The teacher sent the study materials to the students in advance through the online channel and also communicated with the group through the online chat to build the knowledge framework of cost-effectiveness analysis. In this process, the teacher guided the students to master the direct, indirect,

and hidden costs of the treatment of neonatal jaundice and the adverse drug reaction caused by Yinzhihuang granules and Yinzhihuang injection; assess the patient's therapeutic effect and the medical cost; review the definition of the effect, the principle of identifying the effect, the basic generalization, the evaluation index, and its calculation of the cost-effectiveness analysis, as well as the scope of the cost-effectiveness analysis application.

(c) Discussions and exchanges among students, which should be based on online chat channels, were carried out by answering the teacher's preset questions and creating a debriefing PowerPoint presentation.

(2) During class: Each group selected a representative to report on stage, focusing on the cost-effectiveness analysis of different dosage forms of Yinzhihuang treatment for neonatal jaundice, including the identification of the cost, the assessment of the patient's therapeutic effect for the rational use of clinical medication, and the development of a scientific therapeutic plan for neonatal jaundice. Teachers asked questions to students in groups, and conversely, students sought clarification from teachers in groups. The teacher provided comments on the learning outcomes of each group, summarized the key points of the cost-effectiveness analysis, and expanded on the content as appropriate, using the presentation prepared by the students as the basis for assessment. Cost-effectiveness analysis is an evaluation method that measures the input costs of an intervention program in monetary terms, expresses the output results in terms of effect indicators, and compares the costs and effects of the intervention program to determine the economy of the intervention program. Evaluation indicators for cost-effectiveness analysis include cost-effectiveness ratios and incremental cost-effectiveness ratios.

(3) After class: Students summarized the relevant knowledge of cost-effectiveness analysis and the application of the method in specific clinical cases in relation to the case. Teachers collected students' opinions and suggestions on the flipped classroom combined with case-based teaching mode and combined the feedback to improve the course content process and perfect the teaching mode.

2.3. Evaluation of teaching effect

With reference to the scoring standard of teachers' evaluation of education quality (SEEQ) and the evaluation of clinical pharmacy teaching quality [8], a questionnaire was designed and distributed through the Sojump platform to collect students' feedback and evaluation of teaching quality on the flipped classroom combined with case-based teaching mode.

2.4. Statistical analysis

The data were processed and analyzed through the Sojump platform and SPSS25.0 statistical software, and the count data were expressed as cases (%).

3. Results

All 14 students completed the questionnaire. In the questionnaire, about 80% of the students thought that the flipped classroom teaching method has a positive impact on teaching and can effectively stimulate the students' interest in learning. It can enhance the overall learning efficiency of the students through the teacher's teaching link design and teaching guidance, the teaching of a large number of interactive links can be further enhanced between teachers and students as well as between students, the specific details are shown in **Table 1**.

Table 1. Evaluation results of teaching quality of flipped classroom and case-based teaching method [n (%)]

Evaluating content	More helpful	Somewhat helpful	Not helpful
Mobilizing motivation and initiative for learning	12 (85.71)	2 (14.29)	-
Stimulating interest in learning	11 (78.57)	2 (14.29)	1 (7.14)
Enhancing learning efficiency	12 (85.71)	2 (14.29)	-
Improving language expression ability	9 (64.29)	4 (28.57)	1 (7.14)
Facilitating the understanding and memorization of learning content	13 (92.86)	1 (7.14)	-
Improving the comprehensive application of pharmacoeconomic knowledge	12 (85.71)	2 (14.29)	-
Improving teamwork and communication skills	13 (92.86)	1 (7.14)	-
Improving teacher-student interaction	12 (85.71)	2 (14.29)	-

4. Discussion and conclusion

The development of the case-based teaching method should be student-centered. The ultimate goal of teaching is to complete the transfer of knowledge and ideas. The development of the case-based teaching method can allow students to more deeply understand the knowledge through the case, the case can confirm the knowledge that students have learned, and vice versa, the knowledge can be further applied in the next case study. Having their own strengths and weaknesses, the flipped classroom teaching method and the case-based teaching method can effectively complement each other to enhance the actual teaching effect of pharmacoeconomics [9]. For clinical pharmacy students, the flipped classroom combined with case-based teaching method can enable students to better understand the basic concepts and theories of pharmacoeconomics. Students can master the necessary knowledge and skills by watching relevant videos or reading relevant literature in advance, and then gain a deeper understanding of the practical application of pharmacoeconomics through case analyses and discussions in the classroom, and the flipped classroom combined with the case-based teaching method can stimulate the students' interest in learning and thinking skills. In the process of case analysis, students need to improve their comprehensive analysis and practical operation skills through data analysis, decision making, and other practical activities, which are of great significance to their future work and study.

The study of the flipped classroom combined with the case-based teaching method in teaching pharmacoeconomics has shown that by implementing the pre-tests and explaining videos online, students can be provided with a more efficient and convenient way of learning. Students can choose to master their knowledge more freely and engage in case analyses and discussions with their teachers and classmates in the classroom to gain a deeper understanding and application of pharmacoeconomics-related concepts and skills [10]. In short, the flipped classroom combined with the case-based teaching method is an innovative educational approach and personalized and flexible teaching method designed to meet the needs of today's students [11]. However, in the actual pharmacoeconomics teaching classroom, the application of the flipped classroom combined with case-based teaching is still deficient, such as teachers need to spend a lot of energy and practice in the classroom to prepare for the teaching of meaningful cases and planning teaching programs. If the teacher hastily carries out the teaching without sufficient preparation, it will lead to a greatly reduced application effect of the flipped classroom combined with case-based teaching. Therefore, in order to ensure the application of the teaching method, teachers must be able to grasp the progress of classroom teaching, summarize the teaching difficulties, and provide a basis for subsequent teaching.

The development of society makes the current society more and more welcoming to clinical pharmacy

students, but the highly mature market-oriented sales model is also putting forward higher standards for clinical pharmacy students. In the teaching of pharmacoeconomics, it can be combined with practical cases and data, so that students can better understand and apply the knowledge they have learned [12]. For example, the types of diseases that are widely prevalent in the current market, such as diabetes, hypertension, etc., can be selected, so that students can explore and analyze them through the perspective of data analysis and combining drug treatment options. Such a teaching mode can enhance students' hands-on ability and practical skills, and it can make students better understand the current situation and trends of the pharmaceutical market. Therefore, the flipped classroom combined with the case-based teaching method is an emerging teaching mode, which takes students as the main body of the learning process, emphasizes watching videos, literature, and other self-learning materials in advance, and consolidates and explores the knowledge in the classroom in order to achieve better learning results.

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Disclosure statement

The authors declare no conflict of interest.

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