The Application of Case-Based Learning in the Training of Master of Nursing Speicalist -- Taking the *Pharmacotherapeutics* as an Example

Jia Liu[1,a], Shengnan Bi[2,b], Yashuang Zhou[1,c], Wenxuan Cao[1,d], Lijing Li[1,e], Yajie Zhang[1,f], Ruili Li[3,*]

{ccliujia1002@126.com[a], 54556697@qq.com[b], 2272598295@qq.com[c], 21203070602@stu.ccucm.edu.cn[d], lilijing66@163.com[e], 7999435@qq.com[f], 377311060@qq.com[*]}

Department of Pharmaceutical Science, Changchun University of Chinese Medicine, Changchun 130117, China[1];
Clinical Pharmacy Department, Affiliated Hospital of Changchun University of Chinese Medicine, Changchun 130117, China[2];
Graduate School, Changchun University of Chinese Medicine, Changchun 130117, China[3]

Abstract. Objective: Based on the preparation and delivery of a teaching case in the Master of Nursing Specialist (MNS) course *Pharmacotherapeutics* (PT), the basic requirements of a teaching case, the process of its preparation and the pedagogical approach of case teaching are presented. Methods: This paper focuses on the design and development of a teaching case in the course of PT of MNS as an example, introducing the characteristics if Case-Based Learning (CBL), how to choose a teaching case; the teaching conditions needed in case teaching, the preparations needed by the teacher and the students as well as how to carry out the teaching of the case, the design of the teaching process and the evaluation after the class. Results: Through this CBL practice, students can master the basic theoretical knowledge of drug therapy, deepen the understanding of the clinical application of drugs and the importance of subsequent professional nursing, cultivate the clinical thinking and ability of clinical drug therapy and professional nursing, and organically integrate the knowledge and skills related to multiple disciplines so as to improve the quality of the students' work and their ability to work in the real work in the future. Conclusion: CBL can improve classroom efficiency.

Keywords: Case-Based Learning; Pharmacotherapeutics; Master of Nursing Specialist

1 Introduction

Case-Based Learning(CBL) can be defined as a teaching method that significantly improves the efficiency of teaching and learning by using a specific teaching case as the basis for guiding students to discuss, propose and solve problems in the context of the case [1-2]. CBL requires students to think, analyze, and make decisions independently, and can be stimulated and motivated to learn by reviewing the literature prior to class and obtaining answers to questions from textbooks, tools, and relevant clinic guides[3]. CBL involves the use of patient care scenarios (actual, adapted, or hypothetical), and is designed to help students develop critical thinking and problem-solving skills[4-5]. CBL is a clinical teaching method mainly carried out by selecting typical cases and combining theoretical concepts with actual cases [6],

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and it has now been widely used in the teaching training of MNS. Especially in the course of pharmacy education, the knowledge retention rate of students who completed a CBL actually increased[7].

Pharmacotherapeutics (PT) is a patient-centered science that focuses on the theories and methods of drug prevention and treatment of disease [8]. With the purpose of improving patients' quality of life, it applies the basic theories and knowledge of multidisciplinary to rational selection of drugs for treatment to maximize efficacy and minimize therapeutic risk[9].

The Chinese Professional Degree Case Center Library (https://case.cdgdc.edu.cn/) has not yet retrieved cases taught by nursing-related graduate students, and there are no case resources available for teaching, and the case teaching of PT in the MNS belongs to the blank stage.

In view of this basic situation, this group combines years of teaching experience in the teaching and research department, collects typical clinical cases, builds a case base with the help of network teaching platform, puts forward the idea of demonstrative research on teaching cases of *PT*, and through the demonstrative research on a case (a case of analysis of medication and development of nursing care plan for patients with type 2 diabetes mellitus, hyperuricemia, and acute attack of asthma), the teacher and the pharmacist repeatedly practiced and modified, and gained the method of building a case base, the main points of selecting cases, the basic frame of the case, the case specification, the case of the effect of the case of teaching the assessment system, and so on.

2 Teaching case

2.1 Characteristics that a teaching case should have

Case is the core and soul of case teaching, leaving the case, case teaching will no longer exist, which is also the key point of difference from other teaching models. 5 essential conditions are necessary for a good case.There are solidity, interest, completeness, typicality and enlightening.

2.2 Selection of teaching cases

Barach, J A has pointed out that the selection of cases to meet the seven behavioral purposes and three behavioral processes of teaching and learning effects, detailed information is shown in Table 1 below. There are three ways for teachers to select cases for teaching. Firstly, teachers selected cases suitable for teaching and obtained consent from patients and their families. Secondly, with the permission of the hospital leadership, nurses, pharmacists and teachers worked together to adapt typical clinical cases. Finally, teachers, nurses and pharmacists discussed the cases and wrote lesson plans.

Table 1. 7 behavioral purposes and 3 behavioral processes.

7 Behavioral Purposes	3 Behavioral Processes
Emphasize students' problem-solving behaviors and decision-making skills, Allowing students to demonstrate strong thinking skills, Enabling students to make effective and persuasive analyses of	Engaging students in the case teaching process

problematic situations	
Enabling students to identify and define the essential elemental issues that are closely related to the case Enabling students to demonstrate the desire and ability to apply both qualitative and quantitative analyses	Enabling students to effectively prepare for class
Enabling students to have a broader perspective and a wide range of abilities Enabling students to utilize the information to conduct a specific, in-depth analysis and to prepare specific and complete plans of action	Enabling students to express their thoughts and ideas orally

2.3 Demonstration of teaching case

2.3.1 Case Information

Patient male, 47 years old, married.He stated that he started having shortness of breath an hour ago and that his self-administered medications were not working. PRESENT MEDICAL HISTORY: The patient began experiencing episodes of wheezing 10 years ago and was definitively diagnosed with bronchial asthma. After that asthma recurrent attacks self-administered theophylline tablets, salbutamol sulfate aerosol, etc., the condition control is fair, but colds or contact with allergens after the above symptoms again attack, the treatment improved. One month ago, no obvious cause of cough, cough sputum, sputum white and sticky, accompanied by shortness of breath, obvious after activity, no fever, no cough blood, no night sweats, self-service hormone, phlegm (the specific dosage is not known) and other medications, coughing, coughing sputum, shortness of breath and other symptoms improved. One day ago no obvious cause of cough, paroxysmal dry cough, no sputum, symptoms worsened at night, secondary to the emergence of wheezing, shortness of breath, unable to heat and other symptoms, self-administration of oral antimicrobial drugs (cephalosporins, the specifics of the unspecified), coughing, wheezing symptoms failed to alleviate. After eating at a restaurant two hours earlier, during which someone smoked, he came to the emergency room half an hour later after feeling short of breath and starting to croup, and after attempting to use an albuterol aerosol without symptomatic relief. At the time of presentation, he was an increased heart rate, shortness of breath, wheezing with elevated blood pressure, and oxygen saturation of 85-87%. The doctor diagnosed an acute attack of bronchial asthma.

This is a patient with asthma for 10 years, type 2 diabetes mellitus for 15 years, regular metformin extended-release tablets (0.5 g q.d, po), acarbose tablets (50 mg t.i.d, po). Hyperuricemia for 2 years, regularly taking febuxostat tablets (80 mg q.d po), recently developed joint pain plus one febuxostat tablet (80 mg b.i.d po). Denied smoking, alcohol consumption, and history of drug abuse. The patient's current medications can be seen in Table 2.

Table 2. 7 Basic information about the patient's medication

Drug Name and Specification	Dosage
Dosophylline Tablets (0.2g/tablet)	60mg t.i.d (po)
Ipratropium bromide solution for inhalation (500 μg/vial)	500μg t.i.d (nebulized inhalation)
Budesonide suspension for inhalation (1mg/vial)	1mg t.i.d (nebulized inhalation)
Montelukast sodium tablets (10mg/tablet)	10mg q.n (po)
Metformin hydrochloride extended-release tablets (0.5g/tablet)	0.5g q.d (po)

Acarbose tablets (50mg/tablet)	50mg t.i.d (po)
Ceftriaxone for Injection (2g/branch)+0.9% Sodium Chloride Injection	2g+100mL q.d (iv.gtt)
Febuxostat Tablets (80mg)	80mg b.i.d (po)

2.3.2 Subsidiary issues accompanying cases

Discuss the following 3 questions with group. Question 1: Try to analyze what therapeutic problems exist with this patient's current medications? What is the basis for this? Question 2: What should be the next step in the patient's medication and care plan? Question 3: What are the specific follow-up visits for this patient after discharge from the hospital?

2.3.3 Case Notes

The case applies to the drug therapy of common respiratory diseases in the course of PT part of the content of the study, and guide the students to think, inspired thinking questions are detailed in the following table 3. In analyzing the case mainly from the disease medication, drug-drug interactions, prevention of patient complications, patient education, disease and drug care points to guide the students to think, the flow chart can be seen in the following figure 1.

Table 3. Thought-provoking question

Questions for reflection	Perspectives on Thinking			
What is the comprehensive control goal for this patient? Why?	Acute complications	Chronic complications		Other
What are the risk factor control goals for this patient? Why?	Asthma	Type 2 Diabetes	Hyperuricemia	
What medication should be used to treat	Asthma Treatment Drugs	Type 2 Diabetes	Gout Treatment Drugs	
What are the non-pharmacological routes	Medical Nutrition Therapy	Exercise therapy	Improving Adherence	
How to conduct patient self-monitoring	Monitoring asthma control	Chronic complications		
How the patient's next medication and care plan should be developed	50mg t.i.d (po)			

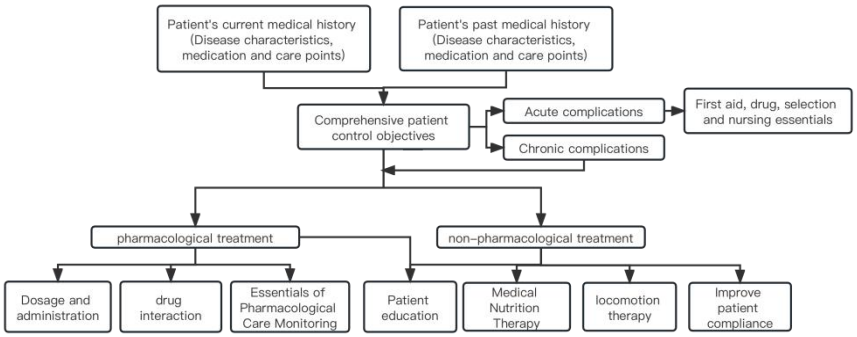

Fig. 1. Pathways of thought that can be referenced to complete the analysis

3 Classroom Design

3.1 Pre-conditions

3.1.1 Teacher preparation

The instructor should send the cases and reflection questions, as well as recommended learning resources, to the students at least one week prior to the class and group the students in sizes of 10 to 15 students [10]. The instructor should understand the focus and difficulty of the course, but also identify the main thesis of the case, teaching objectives, student assignments, case-related questions, and analysis of the answers. Teachers invest more time to find information to select cases and have to pay more enthusiasm and patience[11].

3.1.2 Students preparation

Each student spends 2~3 h to study the case before class and reviewing information to think about the case reflection questions before the case is taught.

3.1.3 Classroom preparation

Case teaching discussion is mainly teacher-student, student-student two-way communication, so the ideal case teaching desks and chairs arrangement is students sitting around a round table, but also can be arranged in a different form of desks and chairs, such as squares, rectangles and so on. If the number of students involved is greater than 15, you can consider U-shaped (single-row horseshoe, double-row horseshoe), double-row trapezoidal, three-row curved trapezoidal, etc., Figure 2 provides a more visual understanding of the arrangement of the desks and chairs.

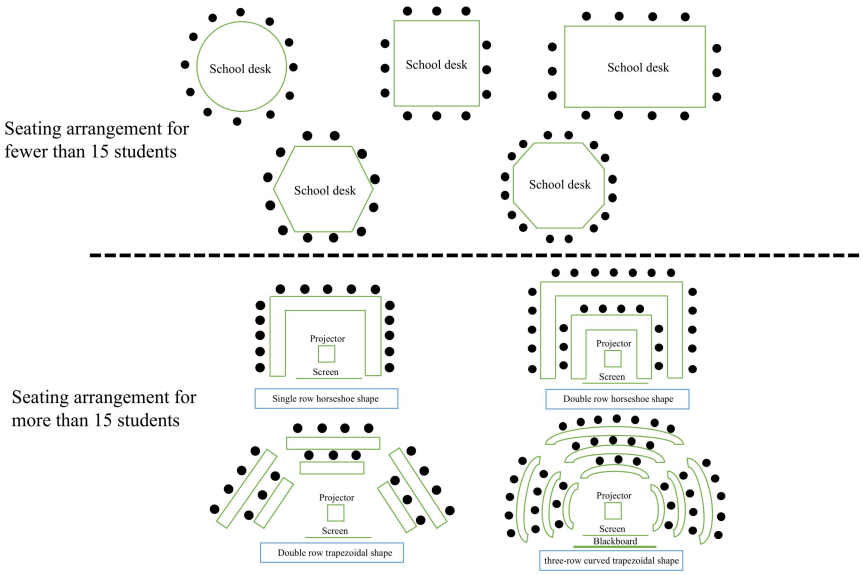

Fig. 2. Arrangement of classroom school desk and chairs

3.2 Demonstration of classroom teaching

Unit 1: Teacher guide students to report the knowledge of the disease and related drug treatment strategies summarized from the case in groups, and evaluates the rationality of the drug treatment strategies and pharmacological supervision points of the case. Beginning (2~5 min), Overview of cases (10 min), Interactive session of analytical discussion and questions organized and guided by the responsible team (40~60min), summarize (10 min), Explanation of the main points (10 min). In the questioning session, random questions are asked according to the thinking flow chart in the case note, and students can answer on behalf of the group. Teacher also can randomly named students to answer. After the lesson, the teacher asks the students to organize the structure of the knowledge network in the form of a mind map and upload it to the online learning platform. Teacher scoring, inter-group evaluation and inter-group evaluation are carried out, and the evaluation results are recorded in the process assessment. CBL allows students to truly master the theory through a case, abandoning the traditional pure theory of boring indoctrination, teacher recognition, credited to the process of assessment.

Unit 2: This class will be reported by the students in groups, and each group will select a representative to go on stage to present the PPT, the report content requirements converge on the pre-medication assessment, the use of drugs for disease, drug-drug interactions, the care of drugs during the period of use, the prevention of patient complications and urgency of the patient, patient education, and the key points of disease and drug care. Teachers will comment and answer questions at the end of the report, and the group will score the report, which will be recorded in the process assessment.[12].

4 Assessment of learning outcomes and feedback on teaching

4.1 Assessment of learning outcomes

The assessment of the students' learning outcomes can be divided into 3 components: First: the knowledge structure charts submitted by the students after the Unit 1 class. Second: the results of the PPT presentations of the groups after the Unit 2 class. Third: and the simulation cases developed by the students and the results of the inter-group assessment during the 2 weeks after the class. The total evaluation score was 100 points, with each component accounting for 35%, 35%, and 30%, respectively.

4.2 Feedback on teaching

A questionnaire was developed to investigate students' engagement and satisfaction with case-based instruction before, during, and after class. The questionnaire entries and results are shown in Table 4.

Table 4.Questionnaire and survey results

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Before class, I actively participated in the case teaching preparation in various ways			2.63%	2.63%	94.74%

I took an active part in the group discussion cases both before class and in class			2.63%	2.63%	94.74%
After class, I thought the teacher's guidance and comments were suddenly enlightened	2.63%			26.32%	71.05%
I have fully participated in the whole case teaching process				21.05%	78.95%
I like case teaching very much			5.26%	50%	44.74%
I am very satisfied with the teaching effect of case teaching			7.89%	39.47%	52.63%
I hope to continue to carry out the case teaching activities in the future		2.63%	13.16%	36.84%	47.37%
This case teaching activity increased my interest in learning asthma, diabetes and gout treatment drugs			7.89%	42.11%	50%
This case teaching activity promoted me to deeply think about the problems of drug therapy, patient education and nursing care in practical clinical cases			7.89%	36.84%	55.26%
This case teaching activity promoted me to use the knowledge I learned to solve the practical problems of the rationality of medication, such as the combination of complex cases in practical work			7.89%	36.84%	55.26%
This case teaching activity promoted my interest in understanding a wider range of background knowledge		2.63%	7.89%	36.84%	52.63%
I hope that this case teaching activity can account for a certain proportion of the scores in the final assessment			10.53%	39.47%	50%
I hope to add case teaching to the other sections of Pharmacotherapy	5.26%		13.16%		81.58%

Note: degree of satisfaction = (number of strongly agree + number of relatively agree) / total number of students × 100%.

5 Conclusion

In summary, we found that adopting CBL to teach PT in the training of MNS can help to improve the student quality of professional master's degree and enrich the resources of China's professional degree teaching casebook.

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Jia Liu, Ruili Li and Lijing Li participated in the design and implementation of the entire article.

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