

## ***Research on the application of oral implant teaching mode oriented by "medical record module"***

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**Abstract:** To explore the application effect of the "medical record module"-oriented teaching mode in practice teaching of oral implant theory based on the textbook *Modern Oral Implantology* (second edition, edited by Su Yucheng) (referred to as *Oral Implantology* for short). 60 undergraduate students were selected as subjects, and real clinical cases were selected. After routine explanation, students were asked to write clinical medical records, which were recorded as pre-test medical records and scored according to the scoring table. After that, 30 students were randomly selected by lottery and divided into experimental group. According to the medical records of the whole process of oral implant therapy in clinical work, fifteen knowledge modules were decomposed, and the students in the experimental group were taught modularly according to the real clinical cases. After the teaching was completed, they were instructed to study *Oral Implantology* by themselves. The remaining students were divided into the control group, and they were taught in the classroom according to the traditional teaching plan. After the teaching was completed, they were instructed to learn *Oral Implantology* by themselves. A month later, the clinical real cases with the same difficulty were selected again. After routine explanation, students were asked to write clinical medical records, which were recorded as post-test medical records and scored according to the scoring table. The application effect of this teaching method in practice teaching of oral implant theory was evaluated through the score of medical records and satisfaction questionnaire. The average score of the medical records written by the students in the experimental group after the teaching intervention can reach  $40.10 \pm 1.80$  points, which is significantly higher than the average score of  $28.80 \pm 1.32$  points ( $P < 0.001$ ) in the control group and the average score of all students' pre-test medical records of  $11.50 \pm 2.27$  points ( $P < 0.001$ ). 95% of students believe that this teaching mode can mobilize students' learning enthusiasm, exercise logical thinking and improve their comprehensive application ability. The "medical record module"-oriented teaching mode can achieve high quality and ideal teaching effect of oral implant theory, which can be considered for reference in the exploration of new oral implant teaching methods in the future.

Oral implantology is an emerging scientific discipline that has exhibited exponential growth in

research and development over the past few decades, with widespread implementation on a global scale [1]. Although oral implantology is an independent branch of study with its unique theoretical knowledge and operational principles, it intersects with multiple disciplines within dentistry. Its scope encompasses various subjects, including basic surgical techniques in oral and maxillofacial surgery, fundamental restorative techniques in prosthodontics, attachment tissues on implant-supported dentures in periodontology, and the biomechanics of implant-supported dentures in oral biomechanics. Thus, it is a comprehensive discipline [2-6]. With the continuous development and progress of materials science and clinical technologies in oral implantology, the application of implant-supported dentures is becoming increasingly widespread in clinical practice. Therefore, it is essential to emphasize the teaching of oral implantology and enhance education in this field [7].

As an interdisciplinary field, education in oral implantology often falls short with reliance solely on teacher explanations, particularly given the substantial need for clinical education and hands-on training in this discipline. Traditional teaching methods typically adhere to linear learning, which is a highly directed, controlled, and procedure-centered approach guided by mentors [8]. This teaching model often struggles to foster students' independent thinking and practical application skills [9-10]. Therefore, to enhance the effectiveness of clinical teaching, there has been widespread attention on expanding new teaching models and methods. In this context, the teaching team of the Implantology Department at Jilin University Stomatological Hospital designed a novel teaching method guided by "modular medical records" based on the book "Modern Oral Implantology" (Second Edition, edited by Su Yucheng, abbreviated as "Oral Implantology"). They conducted experimental teaching with randomly selected students to explore the application effectiveness of this teaching approach in oral implantology education.

## **1. Materials and Methods**

### **1.1 Research Subjects**

Sixty undergraduate students from a specific grade in the Oral Medicine program at Jilin University, who have received education in "Oral Implantology," were selected as the study participants.

### **1.2 Research Content**

(1) Theoretical Learning Guided by "Modular Medical Records": Based on the current status and teaching needs of oral implantology, 15 knowledge modules were extracted from the complete clinical case writing content throughout the entire process of oral implant treatment. These modules included the structure of implant-supported dentures, oral examination, implant design, case selection, timing of implantation and restoration, basic surgical procedures in oral implant surgery, complications in oral implant surgery, principles of upper structure restoration design, impression taking, model fabrication, abutment selection, types and techniques of upper structure restoration, installation of restoration components, follow-up visits, and complications in oral implant restoration [11]. Using these 15 knowledge modules and the textbook "Oral Implantology," PPT teaching materials were developed, and teaching design was carried out to form a comprehensive teaching outline and approach. This represents the theoretical teaching of "Oral Implantology" guided by "modular medical records."

(2) Application of "Modular Medical Records" Knowledge Points in Practical Case Learning: Selected clinical cases were used to guide students in applying the knowledge points of "modular medical records" for case analysis and practice. For example, after explaining foundational knowledge modules to students in class, different cases were selected to guide students in discussing

specific issues such as "implant design" and "timing of implantation and restoration." Personalized case implantation skills were practiced in the simulation lab, cultivating students' flexible application abilities for knowledge modules such as the "basic surgical procedures in oral implant surgery" and "installation of restoration components."

(3) Students were led in real patient reception learning in the implant department, further experiencing and understanding knowledge modules such as "oral examination," "case selection," and "follow-up visits and complications in oral implant restoration." Through simulating clinically realistic cases, students quickly mastered the basic clinical operational and practical skills of oral implantology, deepening their understanding of the fundamental theory and objectively recognizing the basic clinical operational and practical skills of oral implantology.

### 1.3 Research Methods

Cases were selected from the complete clinical case database of the Implantology Department at Jilin University Stomatological Hospital. All participating students received routine explanations of this complete case, and they were instructed to write the clinical case history of this implantation case. The written case history was scored using a scoring scale, recorded as the pre-test case history score. Thirty students were randomly selected from the participants to form the experimental group, while the remaining students formed the control group. For the experimental group students, the modular medical records teaching course was implemented first, and after completing the course, they were then allowed to independently study "Oral Implantology." For the control group students, traditional classroom teaching was conducted based on their undergraduate curriculum and teaching materials, followed by independent study of "Oral Implantology." This teaching and learning process took approximately one month. Subsequently, cases of equal difficulty were selected from the complete clinical case database of the Implantology Department at Jilin University Stomatological Hospital. All participating students received routine explanations of this case, and they were instructed to write the clinical case history of this implantation case. The written case history was scored using the same scoring scale, recorded as the post-test case history score. All participating students were required to independently write two complete clinical case histories of oral implantation and assist in their revision. The writing situation of the case history was observed to evaluate their mastery, understanding, and application of all knowledge points in oral implantology. Additionally, a questionnaire survey was used to assess the experimental group students' evaluation of this new teaching method.

### 1.4 Teaching Evaluation

(1) Scoring Table: A scoring scale was designed for writing oral implant case histories based on 15 case modules, with each module scored as 0, 1, 2, or 3 points (where 0 points indicated complete omission of the module, 1 point indicated incomplete writing of the module with unclear expression, 2 points indicated basic description of over 60% of the content related to the module with clear expression, and 3 points indicated complete writing of all content related to the module with very clear expression). The maximum score was 45 points.

(2) Questionnaire Survey: Referring to the surveys of Wang Fang [12], Wu Mingyue [13], Qian Libo [14], and others, the questionnaire included questions such as whether the new teaching method increased interest in learning, deepened understanding of theoretical knowledge points, improved problem analysis skills, and whether students liked this teaching model.

## 1.5 Statistical Analysis

The data were processed using SPSS 18.0 software. The pre-test and post-test case history scores of all students were compared. Descriptive statistics were used to represent quantitative data as mean  $\pm$  standard deviation. Paired t-tests were used for within-group comparisons before and after the intervention, while independent samples t-tests were used for between-group comparisons before and after the intervention. A significance level of 0.05 was considered to indicate a statistically significant difference. The results showed that the teaching method guided by "modular medical records" exhibited ideal teaching effectiveness.

## 2. Result

The results of the students' case writing scores are shown in Table 1. The average score of the experimental group students in writing medical records after the teaching course was (40.10 $\pm$ 1.80) points, significantly higher than the average score of the control group students after self-study (28.80 $\pm$ 1.32) points ( $P < 0.001$ ) and the average score before the experiment (11.50 $\pm$ 2.27) points ( $P < 0.001$ ). The experimental results indicate that the teaching method guided by "modular medical records" demonstrates an ideal teaching effect.

Table 1: Comparison of Case Writing Scores between Learning Methods

Group	Average Score( $\bar{x} \pm s$ )		T value	P value
	Before	After		
Control Group(n=30)	11.50 $\pm$ 2.42	28.80 $\pm$ 1.32	-47.18 <sup>a</sup>	<0.001
Experimental Group(n=30)	11.50 $\pm$ 2.26	40.10 $\pm$ 1.80	-213.80 <sup>b</sup>	<0.001
T value	$\approx 0^c$	-17.55 <sup>d</sup>	-	-
P value	>0.05	<0.001	-	-

Note: a represents the t value for the comparison of average scores between pre-test and post-test in the control group; b represents the t value for the comparison of average scores between pre-test and post-test in the experimental group; c represents the t value for the comparison of average scores between pre-test in the control group and pre-test in the experimental group; d represents the t value for the comparison of average scores between post-test in the control group and post-test in the experimental group.

The results of the questionnaire survey are shown in Table 2. Among the experimental group students, 97% of the students expressed a positive view on whether the teaching method guided by "modular medical records" could effectively increase their interest in learning. They believe that this new teaching mode allows for a more intuitive understanding of the knowledge points in the textbook and a deeper study of the systematic theory of oral implantology. In addition, under the guidance of real cases and modular medical records, students' ability to identify, analyze, and solve problems has significantly improved, greatly enhancing their learning efficiency. Aligning with clinical practice, starting from practical experiences, and closely integrating complex abstract theoretical knowledge with clinical cases, this new teaching model has received warm welcome and recognition from all participating students.

Table 2: Satisfaction survey form

	The number of people who think yes	The proportion of people who think yes to the total number of people(%)
Whether it increases interest in learning	29	97%
Whether it has deepened the understanding of theoretical knowledge points	29	97%
Whether it improves learning efficiency	29	97%
Whether the ability to analyze problems has been improved	29	97%
Do you like this teaching model	30	100%

### 3. Discussion

#### 3.1 Current Status and Characteristics of Dental Implant Education

With the continuous development of dental implantology, clinicians, researchers, and educators have gradually reached a consensus that the standardization and structured education of dental implantology are becoming a prevailing trend [15-17]. In June 2008, during the inaugural European Symposium on Dental Implant University Education held in Prague, a consensus was released, recommending the inclusion of dental implantology as a component of undergraduate dental programs [18]. The United States, Australia, and numerous European countries have already incorporated dental implantology into their undergraduate dental programs [19]. A research survey of 92 dental schools revealed that only 49% of the institutions offer surgical and restorative courses related to dental implantology, with only 29% of them located in Asia [20]. In China, standardized educational materials for dental implantology have been officially published only in recent years, marking a relatively late initiation of formalized teaching.

As an emerging discipline in oral medicine, dental implantology's core theories and technical systems intersect extensively with other disciplines such as oral and maxillofacial surgery, encompassing theories and practices of surgical techniques; prosthodontics, involving the principles and practices of denture restoration; periodontology, concerning the biology of connective tissue and repair body contact; oral imaging; and dental materials. Dental implantology's intersection with these disciplines is, to a certain extent, an extension and elevation of these disciplines. Therefore, it is imperative for our theoretical and practical teachings to be established on the foundation of these disciplines' teachings. The timing and content of the courses should also be based on the teachings of these disciplines. Moreover, although dental implantology is a relatively independent branch discipline with unique theoretical knowledge and clinical operational skills, its theory and clinical applications are continuously evolving and improving. This progression includes the emergence of osseointegration theory, the introduction of the PASS principle guiding bone regeneration, the development of various bone augmentation techniques, and the shift from a surgical-oriented

implantation concept to restoration-oriented and biology-oriented implantation concepts. On one hand, the continuous development and progress of these theories and practices drive the advancement of the discipline. On the other hand, it necessitates the evolution and updating of our teaching philosophies. Beyond mastering foundational theories, it is crucial to focus on the latest developments in the discipline and promptly familiarize oneself with and adapt to new theories and technologies relevant to dental implantology.

Traditional teaching is a teacher-centered lecture-style learning, emphasizing the delivery of teaching outlines and concepts[21]. Clinical teaching usually involves the restatement of theoretical content from medical textbooks, to some extent neglecting the cultivation of students' clinical thinking and the practical application of clinical theoretical knowledge[22]. Students often lack enthusiasm for lecture-based learning of theoretical knowledge[23]. Additionally, due to the diverse clinical symptoms of patients and the complexity of real case scenarios, the traditional medical teaching model cannot meet the practical training needs of students[24]. To address the shortcomings of traditional teaching methods, in recent years, new teaching methods such as problem-based learning (PBL)[25-27], "case-guided" approaches[28], and "case-based" methods[12] have emerged. These problem-based learning methods are a proactive learning mode that can effectively cultivate various skills in students, such as teamwork, information discovery, problem analysis, and decision-making abilities[29]. However, many introverted students in reality may refrain from actively answering or participating in discussions due to fear or apprehension of being questioned. Some open teaching methods may not be well-received among shy student groups. Therefore, to enhance the effectiveness of dental implant teaching, our academic team has explored a new teaching model. This approach involves the reorganization of traditional textbook-based teaching outlines, restructuring them into 15 knowledge modules based on clinical implant case histories, simplifying the teaching content. Moreover, to avoid the rigidity and inefficiency of traditional teaching methods, this approach integrates practical teaching with clinical cases. Research results indicate that this teaching method significantly enhances students' interest in learning and achieves favorable teaching outcomes.

### **3.2 The advantages of the new oral implant teaching model oriented by "modular medical records"**

Patient records run through the entire process of patient treatment, providing an objective and systematic record of the entire medical process. Writing patient records is an essential clinical skill for clinicians and medical students, playing a crucial role in their training. Guiding students in reviewing, modifying, and composing patient records can assess their abilities in collecting clinical information, diagnosing, decision-making in treatment plans, and patient management, fostering the improvement of their clinical thinking and decision-making abilities[30]. This not only solidifies the theoretical foundation for establishing "modular patient records" knowledge modules but also provides a reliable basis for evaluating the effectiveness of theoretical and practical teaching through patient record scoring metrics.

Numerous studies indicate that in learning based on real clinical case scenarios, teachers providing authentic cases can stimulate students' interest in learning, help bridge the gap between theory and practice, and, through sufficient information and details, encourage students to actively analyze problems, thereby enhancing clinical reasoning skills. Therefore, this new teaching model, by introducing clinical cases to connect the classroom with clinical practice, provides students with a rich learning environment, allowing them to be immersed in real-world situations. This significantly promotes the proficient mastery and flexible application of theoretical knowledge and practical skills by students. Research results indicate a significant gap in the patient record scores between the experimental and control groups, fully demonstrating the reliability and effectiveness of the new

teaching model. Satisfaction survey results indicate the majority of students' approval and endorsement of this teaching method, implying significant potential for the widespread application of the "modular patient records"-oriented new dental implant teaching model in the future dental implant education field.

Indeed, this study has its limitations and shortcomings. Firstly, the overall sample size in this experiment is still relatively small, affecting the accuracy and effectiveness of the research results. Secondly, the experimental group's new teaching method includes both theoretical and practical components, while the control group's traditional classroom teaching is solely theoretical. It may be considered to add a teaching mode with a predominant focus on practical training as the control group to more comprehensively demonstrate the theoretical and practical teaching effects of the "modular patient records"-oriented new teaching model.

In conclusion, the "modular patient records"-oriented new dental implant teaching model demonstrates an ideal teaching effect in both theoretical and practical teaching. It holds enormous potential for application in the field of dental implant education.

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