

Practice and exploration of the construction of radiotherapy for oncology under the background of new medical science

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Abstract: Oncology radiotherapy is a new clinical discipline combining clinical medicine, medical imaging and radiation physics. At present, the teaching of oncology radiotherapy courses is mainly based on the traditional offline classroom infusion teaching. The course is difficult and has many contents. The single teaching method cannot meet the new requirements of core competency training, and the teaching concept of ideological and political education cannot meet the new demand of humanistic care. Therefore, combining with the characteristics of the discipline and integrating clinical practice teaching, the course group carries out teaching reform guided by core competency. It adopts the process of "pre-class evidence-based - case basis - clinical core - scenario simulation - skill practice - scientific research innovation", integrates information technology, incorporates humanistic elements, and proposes a three-dimensional teaching system composed of "online classroom + offline classroom + clinical practice + ideological and political education", which realizes the integration of knowledge and ability and effectively solves the core problems of teaching. Practice has proved that the established teaching objectives have been achieved, and the teaching concept and clinical practice have strong sustainability and promotion value.

Keywords: Oncology Radiotherapy; Teaching Mode; Curriculum construction; Teaching Reform

1. Introduction

Oncology radiotherapy is a professional discipline that is multidisciplinary and multi-disciplinary. As an interdisciplinary discipline, it involves a wide range of complex contents and requires a lot of knowledge to be understood and mastered, which is difficult to be fully described in the limited textbook [1]. With the overall impact of digital information technology on medical treatment, the development of oncology radiotherapy in China is accelerating, and the theoretical knowledge involved in this discipline is becoming more and more profound, which also increases the difficulty of teaching and learning. Throughout the traditional oncology radiotherapy education, the problems of single curriculum, low education quality, and uneven teaching levels of teachers limit the development of the discipline [2-3]. This leads to unsatisfactory teaching effect, teaching satisfaction, and student ability improvement of oncology radiotherapy, which is not conducive to the in-depth training of professional talents.

With the enhancement of people's health awareness, we have entered the "new medicine" era of training outstanding doctors. Therefore, in order to build a first-class medical specialty of oncology radiotherapy with Chinese characteristics and world-class level, cultivate first-class medical talents, serve the construction of healthy China, and promote the competency-oriented teaching reform to promote the systematic, scientific, innovative, and frontier development of the specialty, it is imperative to carry out the teaching reform.

This paper intends to analyze the current teaching status of oncology radiotherapy from the actual situation, put forward new teaching reform measures, and explore the best methods and models of clinical practice teaching of oncology radiotherapy.

2. Analysis of the academic situation of oncology radiotherapy

2.1. Various teaching contents and incomplete knowledge system

The course of oncology radiotherapy is designed for students majoring in medical imaging in the fourth and fifth grade. In terms of the mastery of medical professional knowledge, the students have completed the study of basic medical courses such as anatomy, physiology and biochemistry, but their knowledge reserves are fragmented and their ability to think systematically about medical problems is weak. Moreover, the course of oncology radiotherapy is comprehensive and has many contents, and the students lack the importance, understanding and mastery of clinical basic knowledge, imaging technology and other related knowledge. At the same time, the traditional teaching knowledge system is not enough to expand, and the teaching process of teachers focuses on oncology radiotherapy, ignoring the professional knowledge of related disciplines. The students' learning enthusiasm and participation are not high, and their clinical thinking ability is weak, which cannot meet the connotation of oncology radiotherapy in the new era^[4].

2.2. Single teaching method and insufficient post competency clinical medicine focuses on scientific practice

At present, undergraduates majoring in medical imaging are accustomed to the media integration and large information transmission mode in their study and life, and the demand for personalized learning is also increasingly prominent. However, the traditional teaching method is single, only emphasizes theoretical teaching, and clinical practice is insufficient, leading to the disconnection between theory and practice^[5], which cannot meet the new requirements of core competency cultivation.

2.3. Traditional teaching concepts and insufficient ideological and political education

The course of oncology radiotherapy has the dual attributes of natural science and humanities. The traditional teaching assessment mainly focuses on students' professional achievements, while the professional spirit education such as humanistic spirit, doctors' benevolence, ideological and political education is insufficient, resulting in tense doctor-patient relationship, low social satisfaction and other problems, which cannot meet the new demand for humanistic care^[6-7].

Oncology radiotherapy is a multidisciplinary cross-discipline, and the lack of a variety of basic knowledge and the lack of learning initiative leads to students' difficulty in forming a complete knowledge system, and it is also difficult to integrate the knowledge they have mastered, which obviously cannot meet the clinical needs. Therefore, how to integrate the clinical practice teaching mode according to the characteristics of the subject is a problem faced by oncology radiotherapy and urgently to be solved. This study intends to solve the above problems from the actual situation, and explore the best methods and models of clinical practice teaching of oncology radiotherapy.

3. New measures for teaching reform

In view of the above problems, this course group aims at the fragmentation of knowledge reserve of students in oncology radiotherapy, the weak ability to think about medical problems systematically, the lack of humanistic ideological and political education and other elements, and constantly explores the construction and reform and innovation of hybrid courses. Combined with the characteristics of our comprehensive and research-oriented university, the specialty is oriented to cultivate research-oriented and compound medical talents, and pays attention to cultivating oncology radiotherapy talents with "Taoist, benevolent, academic, technical and artistic".

The teaching philosophy of student development as the center, professional spirit cultivation as the premise, and post competency as the guidance of the curriculum reform is adopted. The moral education, medical humanities, ideological and political education and other elements run through the whole teaching process. The mixed teaching strategy of online, offline, clinical and ideological and political education is adopted. In the course of teaching, the fragmented knowledge points such as anatomy, lymphatic drainage, pathology, staging and other contents are integrated together through typical cases, and the advanced information teaching technology is integrated to improve students' knowledge reserve. At the same time, the comprehensive clinical application is strengthened, and the

cross of tumor radiotherapy courses and biology, chemistry, clinical medicine and other disciplines is emphasized. The core values of medicine and other higher-order abilities are cultivated, so that students can obtain good clinical thinking ability and post competency. And the diversified and systematic evaluation method is adopted to eventually cultivate tumor radiotherapy talents with high knowledge reserve, high ability and high care. Please see Figure 1 for a detailed flowchart of teaching reform.

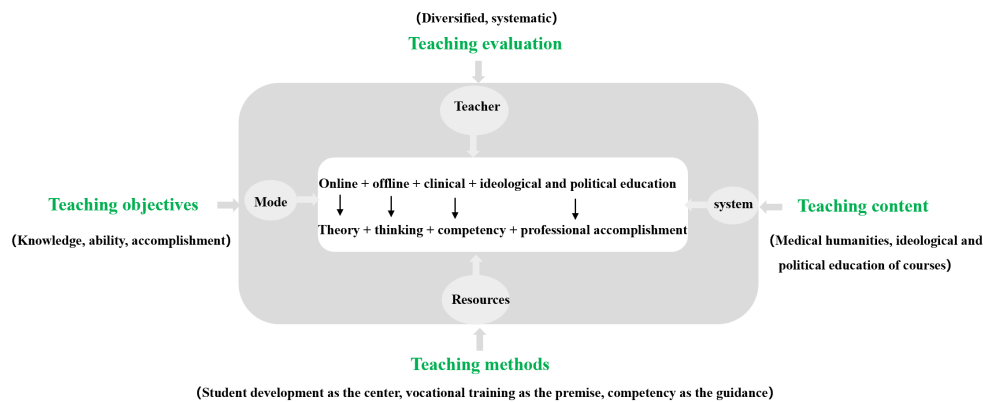


Figure 1: Flowchart of teaching reform

3.1. Reconstructing teaching objectives and proposing a new teaching mode

Different from traditional teaching, the course group reconstructs the training objectives suitable for students of tumor radiotherapy with the guidance of core competency. Taking clinical as the core, case as the basis, and ideological and political education as the guidance, a new medical education mode of "online + offline + clinical + ideological and political education" is constructed, so that students can master the basic theory while cultivating clinical thinking ability, and improve post competency through clinical practice.

3.1.1. Knowledge objectives

Consolidate professional foundation, understand clinical knowledge of tumors in various parts, make diagnosis and differential diagnosis, apply clinical data, integrate relevant theoretical knowledge of tumor radiotherapy, evaluate different radiotherapy techniques and methods, and apply them flexibly to complete the transition from theory to practice.

3.1.2. Bility objectives

To strengthen practice, have the ability to read tumor-related films and operate on radiotherapy skills, strengthen the awareness of medical-industrial combination, medical literature combination, and medical-theoretical combination, learn to integrate knowledge, have the ability to find and solve problems, be good at independent learning, establish an open clinical diagnosis and treatment thinking mode, and be able to verify medical hypotheses through scientific and rigorous experimental design to improve the ability of medical technology innovation.

3.1.3. Quality objectives

To establish the concept of whole-process management of tumor patients, firm professional belief, strengthen the concept of big health, establish a sense of social responsibility, and cultivate sound professional ethics and medical humanistic care spirit. Adhering to the scientific attitude of seeking truth from facts, having rigorous and rational thinking, having the concept of medical innovation and lifelong learning, and teamwork quality, combining personal development with the development of medical career, and becoming "warm" oncology radiotherapy talents.

3.2. Integrate teaching content and reshape the knowledge system

In view of the key problems to be solved in the teaching reform of oncology radiotherapy course, the course group has been continuously accumulating and updating the course content and resource construction. Taking student development as the center, professional quality training as the premise, combined with the actual situation of our hospital, all departments cooperate together, organically combine the knowledge, ability objectives and ideological and political, quality objectives of the course,

systematically integrate the course content, and establish a more reasonable knowledge structure. The situational teaching mode is adopted to reconstruct the classroom mode according to the key steps of "theoretical learning-case discussion-raising questions-target area delineation-answering questions". The online classroom and offline classroom are connected through medical records, and the classroom extension of "basic + clinical + innovative practice" is carried out. The knowledge transmission and comprehensive ability training are combined with the value shaping of respecting patients. To pay attention to quality education, cultivate clinical diagnosis and treatment thinking and clinical diagnosis and treatment decision-making ability, and establish a patient-centered service concept, from basic to advanced, step by step, interwoven. Please see Figure 2 for a detailed flowchart of the integrated knowledge system of various subjects.

3.2.1. Online classroom

Online course content is the basic guarantee of teaching. According to the requirements of the teaching syllabus of oncology radiotherapy, combined with the latest clinical guidelines and literature, the use of information technology, relying on the MOOC online platform, the integration of course content and structure, the construction of online electronic teaching resources including courseware, homework, question bank and other content, real-time extension and update of knowledge level. Students learn different treatment methods of tumors, radiation therapy principles and methods and other basic knowledge through online classroom, establish the multidisciplinary concept of tumor treatment, and complete the study of theoretical knowledge in an all-round way through discussion, in-class test, examination and other forms. At the same time, for the evaluation of teaching and learning, the establishment of teacher-student mutual evaluation resources [8].

3.2.2. Offline classroom

Offline course content is carried out in the form of small lectures, case discussion, teaching rounds, target area delineation and so on, so as to deepen students' learning and cognition of online course content. Offline classroom pays attention to the construction of teaching materials, question bank, case library and other resources, and builds a case library of 20 common tumors and a radiotherapy target area delineation map. Case-oriented, make full use of clinical resources, and cultivate students' clinical thinking ability and innovation ability. And according to the feedback results of students' knowledge evaluation, the knowledge points of the case library are constantly updated and adjusted. The construction of the question bank was adjusted according to the characteristics of the change of the question type of the practicing physicians.

3.2.3. Clinical practice

As the national key clinical specialty construction unit of tumor radiotherapy, the teaching and research section of radiotherapy, under the guidance of the educational administration department, according to the teaching and training objectives, plays a guiding role in expanding the horizon and ability training, combined with the latest research progress in the field of radiotherapy, adds new technologies, popular science knowledge, expert interviews and other content related to the course content. In the clinical practice, the teaching content and the transformation of scientific research are paid attention to, not only providing theoretical guidance for the ability development of the students, but also providing a platform for research and visiting practice, and opening a face-to-face communication platform with scientific research experts and clinical experts, so as to comprehensively improve the clinical practice ability and post competency of the students.

3.2.4. Ideological and political education

Combined with the characteristics of the tumor radiotherapy course, from the discovery of x-ray by Roentgen and the discovery of radium by Curie to the revolutionary contribution made by the older generation of radiotherapy experts to the development of radiotherapy, fully excavating the traditional Chinese culture, red gene, party history and party building knowledge and other elements, the relevant medical history is set in the teaching content of each chapter. In the process of radiotherapy target delineation, trainees should learn to think in another's position. Every stroke in the target delineation is related to the interests and risks of patients. If the target delineation range is too large, it may lead to obvious side effects of patients; and if the target delineation range is too small, it may significantly increase the risk of tumor recurrence of patients. In the case discussion, students should be inspired to conduct open discussion from the perspectives of cherishing life and humanistic care, think in another's position about humanities and ideological and political issues in medicine, and fully integrate the ideological and political factors of professional ethics, medical benevolence, and boundless love into clinical teaching [9].

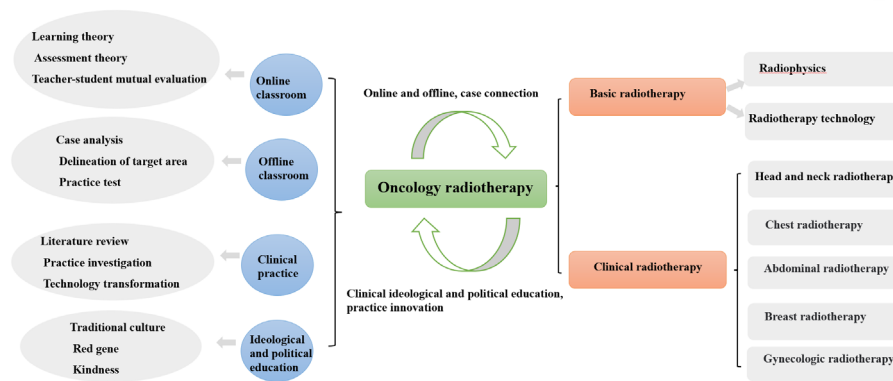


Figure 2: Flowchart of the Integrated Knowledge System of Various Subjects

3.3. Improve teaching resources and optimize teaching process

Integrate information technology and introduce the teaching process of "pre-class evidence-based - case basis - clinical core - scenario simulation - skill practice - scientific research innovation". Based on the SMART principle, combine the diversified innovative teaching methods of situational, experiential, and autonomous, and establish the scientific thinking of finding scientific problems from clinical problems of tumor radiotherapy. Please see Figure 3 for a detailed diagram of the teaching process.

3.3.1. Pre-class evidence-based

Mainly composed of three parts: "theoretical learning - self-assessment - familiar case". Students complete the online basic theory study of tumor radiotherapy on MOOC online platform. On the premise of mastering the basic knowledge of radiotherapy, they conduct self-testing and self-evaluation. Then the teacher gives clinical cases according to the teaching content and puts forward the problems that need to be solved in the clinic. Based on evidence-based methods and ideas, students form their own views through independent learning, discussion, literature review and other ways to independently think about the role of radiotherapy in tumor treatment. The teacher dynamically tracks the learning progress of students and provides online Q&A.

3.3.2. Case-based

Cases are the discussion links that closely connect online courses and offline courses, which are the integration of knowledge expansion and teaching resource construction. Students report their views formed after evidence-based and thinking. The teacher uses CBL, PBL, TBL, heuristic, practical and other teaching methods to guide students to carry out extended thinking of case problems and sort out the problems they are interested in, so as to motivate students to complete the construction of autonomous knowledge system^[10].

3.3.3. Clinical core

According to the BOPPPS teaching model, clinical cases run through the whole teaching process in and out of class. Through case discussion, clinical problems are introduced, the dynamic change process of the disease is introduced step by step, typical clinical symptoms and signs are sorted out, and the complexity and multifaceted nature of the disease are further discussed in the form of a group, the pathogenesis is discussed, the location and imaging performance of the lesion are described, the diagnosis and staging of the disease are made, and the target area of radiotherapy is designed according to the principle of comprehensive treatment. According to the teaching design of "medical history and physical examination-auxiliary examination results-diagnosis and differential diagnosis-treatment principles-target area delineation-summary and knowledge expansion", teachers analyze the impact of humanistic and policy factors on the occurrence and development of the disease from the perspective of disease prevention and control policies, and guide students to independently give personalized treatment plans, and stimulate students' sense of responsibility for the treatment of diseases and the sense of mission to strive for knowledge.

3.3.4. Scenario simulation

There are many abstract definitions in the medical knowledge of oncology radiotherapy, which is not conducive to the integration of students' knowledge and ability. Moreover, radiotherapy is a large department composed of multiple departments. In view of the abstractness of radiotherapy and the

particularity of the department, students are asked to play different roles, from playing patients, family members, radiotherapy doctors, radio physicists, radiotherapy technicians, administrative personnel and other different roles. Combined with the study of real cases, cooperative learning, group discussion, the decision-making of the disease from diagnosis to treatment is simulated, and the differences in the outcomes of different treatment plans are compared. Students are allowed to truly integrate into the role, have a strong sense of involvement and responsibility, and actively solve problems, which is helpful to improve students' clinical thinking ability and strengthen doctor-patient communication ability.

3.3.5. Skills practice

Clinical skills are one of the core competencies of medical students. In the teaching process of this course, relying on the "Internet +" technology, with the help of a large number of models and props, the use of VR virtual reality technology and three-dimensional reconstruction technology can deepen students' understanding of knowledge, help students to integrate theoretical knowledge with practice, expand clinical concepts and thinking, and repeatedly drill to improve clinical comprehensive ability [11-12]. Based on the unique characteristics of tumor radiotherapy, strengthening the learning of multimodal imaging technology throughout the whole process of tumor radiotherapy teaching can make students fully recognize the importance of multimodal imaging technology in diagnosis, accurate target delineation and efficacy evaluation [13]. After class, the students are guided to use professional website information to consult literature, organize regular note competitions, medical painting and mind mapping activities, organize students to participate in popular science propaganda, cultivate humanistic feelings, and experience the connotation of the medical students' oath of "the skill of the doctor" and "the heart of the doctor".

3.3.6. Scientific research innovation

In the process of tumor radiotherapy teaching, through clinical problems, help students gradually familiar with the general rules of scientific research, guide students to put forward hypotheses, and conduct rigorous scientific experiments, namely clinical-based scientific research design [14]. Give full play to the scientific research advantages of teachers, organically integrate the latest research achievements of the radiotherapy scientific research team with classroom teaching content, hold scientific research meetings in the form of groups, read scientific research literature, provide students with a scientific research platform, organize students to visit, further study related innovation exploration or clinical diagnosis and treatment activities, so as to cultivate students' medical innovative thinking. At the same time, encourage students to actively apply for large-scale innovation projects, participate in innovative practice competitions, realize the training objectives of students' innovation ability, and meet the needs of personalized learning development.

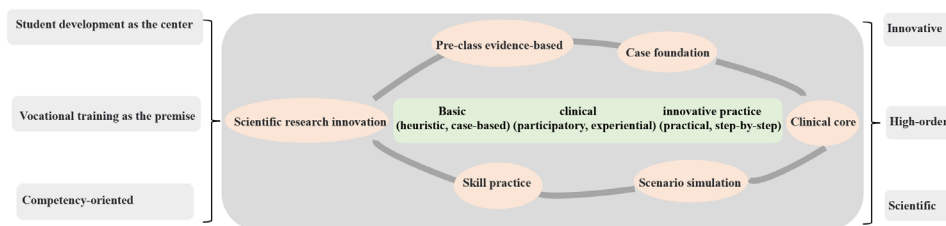


Figure 3: Diagram of teaching process

3.4. Improve the level of teachers, comprehensive evaluation and assessment

Adopt diversified evaluation methods, and pay attention to teaching and learning evaluation in course assessment [15]. Each semester, supervisors randomly inspected the teachers, and commented on the teaching situation and teaching plans after class. According to the evaluation feedback, the teacher training was strengthened in time to improve the teaching ability of the teachers. The students' scores were composed of online course tests, offline course tests, target area delineation tests, ideological and political quality, scientific research ability assessment and comprehensive application tests, and the combination of process assessment and final assessment was promoted. Among them, the process assessment accounted for 40% of the total score of the students, and the final assessment accounted for 60% of the total score. More attention was paid to the comprehensive ability and innovative thinking of the students to analyze complex clinical problems using the basic medical knowledge they had learned, and the ideological and political quality of the students, so as to comprehensively assess the students' knowledge, ability and quality. The feedback of the evaluation results was paid attention to, and the

evaluation content of each link of teaching and learning was fully refined, and the teaching plan and method were adjusted in time. Please see Figure 4 for a detailed flowchart of diversified assessment and evaluation.



Figure 4: Flowchart of diversified assessment and evaluation

4. Radiation of the achievements of the course construction

The construction and reform and innovation of the course of Oncology Radiotherapy adopts the new mode of medical education integrated with "online + offline + clinical + ideological and political education" to reconstruct the teaching system. In the teaching process, the comprehensive application of information technology is emphasized. At the same time, combined with the scientific research advantages of teachers, targeted exploration and research are carried out, and the "new medical science" course is gradually constructed. The theoretical level, clinical thinking ability and professional quality of the trainees are significantly improved.

4.1. Improving knowledge reserve

The trainees actively participate in the school knowledge competition and the production of popular science works related to radiotherapy, and improve the mastery, positioning and application ability of knowledge. In clinical practice, they can communicate well with patients and their families, and provide health education and answer questions. The teaching effect of the course is remarkable, the employment rate is gradually increasing, and the trainees' satisfaction score is high. 96% of the trainees think that the knowledge they learn can meet the clinical application in the survey after graduation.

4.2. Enhancing professional ability

The trainees actively participate in various skills competitions, pay attention to the integration of knowledge and ability, the integration of basic knowledge and clinical application, and win awards in the Internet + skills competition for many times. The college conducted a questionnaire survey on the employers of the graduates, and the results show that most of the employers are satisfied with the quality of the graduates.

4.3. Pay attention to humanistic quality

Through simulated treatment decisions, the students have a strong sense of role replacement, greatly stimulate the students' interest in independent learning, gradually develop a cooperative and exploratory learning mode, and make the students pay more attention to the humanistic care of patients and their families.

5. Further construction plan and thinking

According to the training objectives and requirements of oncology radiotherapy talents, combined with professional characteristics, the course group adopts diversified teaching methods guided by guidance, cooperation and exploration, focuses on training the students to master basic skills, clinical

thinking and problem-solving ability, and develops the students' spirit of scientific innovation. It has achieved certain results, but still needs further improvement.

5.1. Improve the integrated teaching mode and gradually promote its application

According to the students' performance and teaching feedback, the clinical practice hours are insufficient, and need to be further improved to achieve the teaching goal of improving post competency. In order to grant knowledge and reduce the burden of students at the same time, the production practice is integrated into this teaching mode ^[16]. The theory, thinking and practice are perfectly unified, and this mode is further promoted.

5.2. Build a MOOC system with information technology

Combined with the latest clinical guidelines, new technologies of radiotherapy and other continuous updates of teaching content, optimize the exercise structure and evaluation system, increase clinical practice, and further integrate theory and practice. Based on the theoretical MOOCs ^[9], the MOOCs of Typical Cases Analysis of Tumor Radiotherapy and Difficult Cases Analysis of Tumor Radiotherapy were built, and MOOC groups were established to provide high-quality courses for students at different levels, publish digital textbooks and apply for national quality online open courses.

5.3. Deepen clinical resources and establish databases

Further explore clinical resources, establish systematic teaching case database of radiotherapy system, and complete clinical information, imaging, prognosis and other information ^[17]; establish different case databases according to different tumor classifications to provide case resources for later course construction and improve students' post competency.

6. Conclusion

This article delves into the practice and exploration of curriculum construction for oncology radiation therapy under the new medical science background. By combining the characteristics of oncology radiation therapy, a teaching reform plan oriented by core competency is proposed. Through integrating clinical practice teaching, information technology and humanistic literacy elements are incorporated. After practical verification, the teaching philosophy and clinical practice have demonstrated strong sustainability and promotional value. In the future, we will continue to improve this teaching system and explore new teaching methods and means to meet the needs of curriculum teaching for oncology radiation therapy under the new medical science background. Meanwhile, we also look forward to more educators and scholars joining the research in this field to jointly promote the in-depth development of curriculum construction for oncology radiation therapy.

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