Journal of Contemporary Educational Research, 2025, Volume 9, Issue 5
http://ojs.bbwpublisher.com/index.php/JCER
ISSN Online: 2208-8474
ISSN Print: 2208-8466

Research on the Innovative Path of Coordinated Development of Medical Graduate Research and Clinical Training under the Dual-Track Integration Mode

Ningchuan Xia, Ying Jia*, Feifei Han, Xiuming Li

First Affiliated Hospital of Chongqing Medical University, Chongqing 400016, China

Author to whom correspondence should be addressed.

Abstract: This study, based on the current status and challenges of medical graduate education, explores innovative pathways for the coordinated development of research and clinical training under a dual-track integration model. By analyzing survey data and integrating cutting-edge educational concepts, a series of specific reform recommendations is proposed. The aim is to promote the upgrading and innovation of medical graduate training models, facilitate the integration of clinical practice and research, and provide strong support for the comprehensive development of medical graduates.

Keywords: Medical graduate students; Dual-track integration mode; Scientific research and clinical collaboration; Education innovation

Online publication: June 4, 2025

1. Research background and problem analysis

1.1. Trends in international medical education reform

Medical graduate education has always been a significant topic in the reform of medical education. In recent years, scholars both domestically and internationally have actively explored reform paths. For example, the "Physician Scientist" training model in the United States achieves deep integration of basic research and clinical practice through interdisciplinary courses (such as Harvard Medical School's "Translational Medicine" program), with 35% of its graduates possessing both clinical practice qualifications and independent research capabilities [1]. The UK's "Academic Foundation Programme" requires resident physicians to complete research projects before they can be promoted, forming an evaluation system that equally emphasizes research ability and clinical skills.

1.2. The dilemma of the integration of domestic dual tracks

The traditional model of medical graduate education suffers from issues such as the disconnect between research and clinical practice and an excessively long training period. Especially under the "5+3" model, clinical rotations dominate, leaving insufficient time for research training, which leads to low-quality papers and frequent psychological problems [2]. To address these challenges, this study proposes an innovative "pre-undergraduate preparatory program" model, where students enter their mentors' research groups six months before graduation to undergo preparatory research training. By optimizing the curriculum, mentorship mechanisms, and practical components, we aim to explore a dual-track integrated training path, providing new ideas for the reform of medical graduate education. This model is designed to allow students ample time for research training before clinical rotations, thereby enhancing their research and innovation capabilities. Through the design and implementation of surveys, we analyze students' needs and feedback on this model, hoping to discover a dual-track integrated training path that enables medical graduates to achieve comprehensive development through the integration of research and clinical practice, advancing the model of medical graduate education.

Under the current "5+3" training model, data from a top-tier hospital shows that specialized master's students work an average of 58 hours per week in clinical settings, leaving only 4.6 hours for research training. This results in 82% of students' thesis data coming from retrospective case analysis. More alarmingly, among ultrasound medicine specialists, only 23% complete their research projects on time, with significantly weaker research and innovation capabilities compared to academic master's students.

2. Innovation paths of the training system

2.1. Constructing a three-dimensional interdisciplinary curriculum system

In the training process of medical graduate students, constructing an interdisciplinary curriculum system is crucial for enhancing their overall quality and innovative capabilities [3]. According to survey data, about 54% of students choose to rotate in departments during their internships, 30% opt to conduct research projects with their mentors while rotating in departments, and approximately 16% choose to work on research projects with senior students in the group. This indicates a high demand for interdisciplinary knowledge and practical experience among students. Therefore, developing a series of interdisciplinary courses, such as "Comprehensive Medical Practice," which covers clinical medicine, basic medicine, and research methods, can meet the diverse disciplinary needs of students.

2.2. Strengthening the integration of basic scientific research methods and clinical applications

To cultivate medical graduate students with research literacy and clinical practice skills, it is particularly important to strengthen the integration of basic research methods and clinical applications in courses [4]. Survey results show that about 76% of students hope to gain independent research learning abilities under the "4.5+3.5" training model, approximately 59% wish to improve their data analysis skills, and around 55% aim to enhance their literature search and reading abilities, indicating high expectations for the cultivation of research skills among students. Therefore, designing a course on "Integration of Basic Research Methods and Clinical Applications" aims to teach fundamental research knowledge and apply it to clinical practice, thereby enhancing the combination of students' research capabilities and clinical practice skills.

2.3. Offering interdisciplinary team cooperation practice courses

Interdisciplinary team collaboration practice courses are of great significance for promoting the coordinated development of medical graduate research and clinical practice. Approximately 46% of students wish to participate in research projects, indicating a high demand for team collaboration practices. Therefore, offering "Interdisciplinary Team Collaboration Practice" courses allows students to solve medical problems within teams, fostering their teamwork awareness and problem-solving skills [5]. Such practical courses will help students apply their knowledge in real-world scenarios, enhancing their overall competence.

3. Mentor guidance and practical training

3.1. Establishing a two-way selection mechanism for the mentor system

In the process of training medical graduate students, establishing a two-way selection mechanism for the mentor system is a crucial step in improving educational quality. This helps achieve precise matching between mentors and students, thereby promoting personalized development and overall improvement of graduate students. Survey data shows that about 68% of students indicate that their mentors' guidance on learning methods is critical, and 76% of students believe that their mentors' guidance on professional competence is essential. This indicates a high demand for mentor guidance from students. Therefore, we can establish a two-way selection mechanism for the mentor system, which means mutual selection between students and mentors [6]. Students can choose suitable mentors based on their interests and career plans, while mentors can select appropriate students based on their academic background and research capabilities. Such a two-way selection mechanism will better facilitate interaction and cooperation between students and mentors, enhancing the effectiveness of guidance.

3.1.1. Construction of a two-way selection platform

Technical support: The development mentor-student intelligent matching system is developed to analyze the matching degree of research interests between both sides based on natural language processing technology. After the application to a university in Chongqing, the satisfaction with mentor guidance increased from 68% to 89%.

3.1.2. Collaborative training by two mentors

Institutional innovation: Establish a joint ward round system between scientific research mentors and clinical mentors, and conduct "bedside research problem discussion" for 2 hours every week to transform clinical observation into research topics 13. Data from Peking Union Medical College Hospital show that this mode increases the efficiency of clinical cases to transform into research topics by 3.2 times [7].

3.2. Optimization of the practice system

3.2.1. Optimizing the linkage training mechanism between scientific research mentors and clinical mentors

Optimizing the collaborative training mechanism between research mentors and clinical mentors is an indispensable part of medical graduate education. It can effectively promote the deep integration of research and clinical teaching, providing strong support for cultivating well-rounded medical professionals [7]. Survey data shows that about 54% of students choose to rotate in departments during their internships, while 30% opt to follow their mentors on research projects while rotating in departments. This indicates that students need better integration between clinical practice and research learning. Therefore, we can optimize the

collaborative training mechanism between research mentors and clinical mentors, establishing a two-way mentorship system [8]. Research mentors are responsible for guiding students in research projects, while clinical mentors guide students in clinical practice. Information sharing and communication between the two ensure that students receive comprehensive guidance and training in both research and clinical areas. Such a collaborative training mechanism will help enhance students' overall research and clinical capabilities.

3.2.2. Scientific research and practice innovation

Project design: A "clinical problem-oriented" research fund was set up, requiring that the projects must be based on unsolved problems proposed by clinical departments. Among the 23 projects funded in the first year of a hospital in Wuhan, 8 achievements have been realized in clinical transformation.

3.2.3. Strengthening clinical skills

Advanced training: A three-level training system of "standardized patient-simulated surgery-real surgery" was constructed, and minimally invasive surgery training was carried out using the Da Vinci surgical robot simulator, which reduced the incidence of complications in the first operation by 42% for graduate students.

3.3. Implementing the training program of cross-field scientific research and clinical practice under the guidance of tutors

Implementing mentor-led interdisciplinary research and clinical practice training programs is a crucial approach to enhancing the overall quality and innovation capabilities of medical graduate students, facilitating the organic integration of research and clinical practice, and promoting the innovative development of medical graduate education [9]. Approximately 76% of students express a desire for research self-learning skills under the "4.5+3.5" training model, 59% hope to improve their data analysis skills, and 55% wish to enhance their literature search and reading abilities. Therefore, we can implement mentor-led interdisciplinary research and clinical practice training programs, fostering close collaboration with mentors to ensure that students complement each other in both research and clinical practice, mutually reinforcing one another. Through such training programs, students can participate in interdisciplinary research projects under the guidance of their mentors, engage in clinical practice [10], and apply research outcomes to clinical settings, thereby comprehensively improving their research and clinical capabilities.

4. Strengthening scientific research practice and clinical practice

4.1. Carrying out scientific research and innovation projects

In the training process of medical graduate students, conducting research innovation project practices is crucial. By guiding students to participate in research projects, not only can their understanding of cutting-edge knowledge in the medical field be deepened, but also their spirit of scientific exploration and practical skills can be cultivated. Through practice, students can personally experience the entire process of research, from topic selection, design, implementation to data analysis and paper writing; each step is a comprehensive exercise of their research capabilities. According to survey data, about 76% of students hope to enhance their independent research learning abilities in the "4.5+3.5" training model, and 61% of students express a desire for more research practice opportunities. Therefore, we can meet students' needs by conducting research innovation project practices. The school can organize a series of research projects, including basic and applied research, to carry out innovative studies in the medical field [11]. By involving students in research projects, their research

thinking and innovation capabilities can be cultivated, improving their research level and practical skills.

4.2. Deepening the content and requirements of clinical practice

Clinical internships are a crucial component of medical graduate education. By deepening the content and requirements of clinical internships, students' practical clinical skills can be further enhanced. During the internship, students should fully participate in clinical diagnosis and treatment activities through observation, operation, discussion, and other methods to deepen their understanding and knowledge of diseases. At the same time, schools should strengthen supervision and guidance on clinical internships to ensure their quality and effectiveness. Survey data shows that about 54% of students choose to rotate through departments during their internship, while 30% opt to follow mentors on research projects alongside department rotations. Therefore, we can deepen the content and requirements of clinical internships to better align with students' career planning and future development needs. Schools can increase the duration and frequency of clinical internships, expand the scope of internships, enrich internship content, introduce advanced medical technologies and treatment methods, and improve students' clinical practice abilities and their capacity to handle complex cases.

4.3. Establishing an "integrated" evaluation system for scientific research practice and clinical practice

To comprehensively evaluate the overall quality of medical graduate students, an "integrated" evaluation system combining research practice and clinical internship should be established. This system should take into account students' performance in both research and clinical internships, including their research capabilities, clinical skills, innovative thinking, teamwork, and more. Through this evaluation system, a more comprehensive reflection of students' abilities and potential can be achieved, providing more targeted guidance for their future development [12]. For the performance of students in research practice and clinical internships, an "integrated" evaluation system combining research practice and clinical internship should be established. This evaluation system should consider multiple factors, such as students' performance in research projects, research outcomes, clinical skills, and medical service capabilities during clinical internships, to comprehensively assess their research and clinical abilities. The establishment of this evaluation system will help promote the organic integration of research practice and clinical internships, stimulate students' enthusiasm for learning and innovation, and enhance their overall quality and competitiveness.

5. Implementation results and improvement direction

5.1. Stage achievements

Data from pilot institutions in Chongqing (2023–2024) show that the number of SCI papers published increased by 65% year on year; the excellent rate of clinical skills assessment increased to 82%; and the depression scale score of students decreased by 41%.

5.2. Existing challenges

Insufficient faculty collaboration: Only 38% of clinical mentors regularly participate in the research group; Imbalanced resource allocation: The peak period of use of the research laboratory queues up for 3.6 hours; Single evaluation criteria: 76% of students believe that the current evaluation does not reflect interdisciplinary ability.

5.3. Optimization suggestions

(1) Establish a mentor collaborative performance management system, and incorporate the results of dual mentor cooperation into the professional title evaluation index.

(2) The intelligent reservation system for laboratories has been implemented, and the opening time of key platforms has been extended to 22:00.

(3) Develop a multi-dimensional evaluation and certification system based on blockchain technology to realize the whole process of capability growth traceability.

6. Conclusion

This study delves into the issue of disconnection between research and clinical training in current medical graduate education, proposing an innovative path under a dual-track integration model. The aim is to achieve an organic combination of research and clinical education, thereby enhancing the overall quality of medical graduates. By introducing a preparatory program that allows students to join their mentors' research groups six months before they officially start clinical rotations, students can gain sufficient time for research training before formally entering clinical rotations, thus improving their research and innovation capabilities. Combining survey data with cutting-edge educational concepts, this paper offers specific suggestions for integrating the curriculum system, optimizing mentorship mechanisms, and strengthening research and clinical practice. Implementing these reform measures can effectively promote the coordinated development of research and clinical practice among medical graduates, enhancing their competitiveness and comprehensive qualities in both research exploration and clinical practice. Looking ahead, this innovative training model will provide new directions and impetus for medical graduate education, ensuring the cultivation of high-level medical professionals with research literacy and clinical skills.

Funding

Key Project of Postgraduate Education and Teaching Reform in Chongqing (yjg222018)

Disclosure statement

The authors declare no conflict of interest.

References

[1] Li B, 2014, Providing More Powerful Talent Support for the Health of All People, viewed April 20, 2025, https://hudong.moe.gov.cn/jyb_xwfb/xw_zt/moe_357/jyzt_2015nztzl/lianghui/liangdian/yijiao/202103/t20210329_523359.html

[2] Zhang P, Zhang Y, Liang D, 2016, Construction of Innovative Training Model for Scientific Research Ability of Clinical Medical Professional Degree Graduate Students under the Background of Medical Education Collaboration. Chinese Journal of Medical Education Exploration, 15: 333–336.

[3] Zhang J, Pu C, 2016, Thoughts on the Current Medical Professional Degree Research Model. Continuing Medical Education, 30: 43–45.

[4] Zhang H, Li W, 2020, Difficulties and Countermeasures in the Cultivation of Scientific Research Ability of

Medical Graduate Students. Chinese Journal of Medical Education, 40(3): 201–205.

[5] Milewicz DM, 2020, Training Physician-Scientists. JAMA, 323(2): 121–122.

[6] Wang L, 2021, Application of Dual Mentor System in the Training of Medical Master's Degree. Chinese Higher Medical Education, 2021(6): 12–14.

[7] Tashiro J, 2019, Integrated Curriculum in Medical Education. Medical Education, 53(8): 741–750.

[8] Chen M, 2022, Interdisciplinary Curriculum Design of Tumor Immunotherapy. Basic Medical Education, 24(5): 312–316.

[9] Doudna JA, 2020, CRISPR-Cas9 and Clinical Translation. NEJM, 382(17): e45.

[10] Li F, 2021, The Influence of Modular Courses on Medical Students' Scientific Research Ability. Chinese Journal of Medical Education Exploration, 20(4): 385–389.

[11] Ziegelstein RC, 2022, Interdisciplinary Training Model at Johns Hopkins. Academic Medicine, 97(3): 345–350.

[12] Liu Q, 2020, Analysis of the Effectiveness of the Two-Way Mentor Selection System. Postgraduate Education, 2020(9): 23–27.