

To Explore the Optimization of the Combined Training Mode of General Surgery Master and Resident Standardized Training under the Integrated Training Mode of “Two-Track Integration”

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How to cite this paper: Liang, Q., Huang, H. G., Luo, J. H., Deng, Q., Wei, M. L., Liang, Y. B., Zhao, Y., Dai, K., & Wei, J. H. (2025). To Explore the Optimization of the Combined Training Mode of General Surgery Master and Resident Standardized Training under the Integrated Training Mode of “Two-Track Integration”. *Creative Education*, 16, 167-179. <https://doi.org/10.4236/ce.2025.162010>

Received: November 10, 2024

Accepted: February 18, 2025

Published: February 21, 2025

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Abstract

In this paper, the dual-track training model of standardized resident training of general surgery was explored and optimized. Under the “two-track in one” mode, it is required that the postgraduate students of clinical medicine should also carry out the professional study of postgraduate degree at the same time of the standardized training of residents. In practice, it was gradually found that this model analyzed the problems of clinical learning, practice training and scientific research thinking ability training of general surgery, and combined with the current situation of clinical and scientific research ability training under the “two-track in one” mode, in recent years. Combined with laparoscopic simulation training, ChatGPT and literature reading were integrated into the “two-track in one” comprehensive learning model, and the future development direction was analyzed and discussed, so as to provide ideas for the comprehensive and three-dimensional exploration of the reform of the “two-track in one” mode, training model of general surgery and the construction of clinical and scientific research ability of master of general surgery. The clinical and scientific research ability of general surgery is discussed and the training model suitable for China is put forward.

Keywords

The “Two-Track in One” Mode, Standardized Training of Residents, Master

1. Introduction

With the continuous development of society and the increasing demand for medical services, the traditional medical education model cannot fully meet the needs of modern medical health. However, big data shows that the traditional education model has certain limitations (He et al., 2024) in cultivating compound talents with clinical work ability and scientific research thinking. In order to adapt to the structural adjustment of national higher education and the development of professional degree graduate education, it is necessary to train the scientific research ability of clinical medicine professionals and improve their clinical skills. Therefore, the Ministry of Education of the People's Republic of China has carried out a reform on the training model of clinical medical postgraduates. From 2015, new students will be enrolled with professional master's degree in clinical medicine, and they will also participate in the standardized training of residents (referred to as "professional master's degree") (Qin et al., 2021). The standardized training of residents and the education of master of professional degree are important contents of medical education after graduation, and the connection of the two is a useful exploration to establish a talent training system in line with the characteristics of the industry (Chen et al., 2020b). General surgery is the basic discipline for clinicians, especially for surgeons. It is a broad and comprehensive clinical discipline (Zhou et al., 2022). General surgeons need not only complex theoretical knowledge such as diagnostics and surgery, but also clinical professional qualities such as surgical operation ability, emergency response ability and doctor-patient communication ability (Yao et al., 2024). Therefore, in order to cultivate medical professionals with both solid clinical skills and certain research ability, in recent decades, China has proposed a teaching model that combines the master's education of general surgery with the standardized training of residents. The implementation of this education model is helpful to cultivate general surgery clinical medical professionals who can solve practical clinical problems and have scientific research ability, so as to provide better service for China's current medical and health care. However, in practice, some problems have been gradually found under this model. How to improve the clinical ability and deal with the relationship between clinical practice and scientific research has become an urgent problem to be solved in the current clinical teaching, which is worth us to find, to think and to solve.

In summary, in order to solve the problem of unbalanced development of clinical ability and scientific research ability, the author generalizes the problems existing in the practice of graduate students in the current resident training base, and tries to put forward the basis of introducing laparoscopic simulation training

under the “two-track in one” mode, combining literature reading and ChatGPT virtual technology as a multi-teaching model. In order to provide ideas for the reform of general surgery training model, a set of training programs suitable for master of general surgery was proposed.

2. Analysis of the “Two-Track in One” Training Model

Under the “two-track in one” mode, the training program of general surgery has been attracting much attention. The master of general surgery pays attention to the cultivation of scientific research and innovation ability and clinical professional ability. In the process of training, traditional Chinese medicine education is coordinated, which improves the training efficiency of clinicians, but there are also various problems in the training process. However, it also faces various problems in the training process.

2.1. Insufficient Professional Knowledge Structure and Limited Clinical Skills Training

Under the mode of “the unity of” dual track, ensure the professional degree of clinical medicine graduate students in the whole process of training can “early clinical, many clinical, not from clinical”, at the same time also led to most of the professional degree of clinical medicine graduate students don’t pay much attention to professional knowledge and knowledge framework to build a summary. As everyone knows general surgery is the largest specialty in the surgical system. It not only has many kinds of diseases, but also has the characteristics of complex and diverse diseases. In order to ensure that the postgraduates of professional degree in clinical medicine have enough time for clinical ability training. The most colleges and universities to reduce the professional degree of clinical medicine graduate students in the school theory course during the period of time, has no separate courses in professional teaching in graduate student period (Pan et al., 2016). The study found that under the “dual-track integration” model, the clinical work time is long, but the time of professional knowledge learning is short. It is easy to have a kind of job burnout under the work. So the initiative learning enthusiasm is low, leading to the lack of relevant professional knowledge of general surgery master (Chen et al., 2020b). In summary, general surgery in China is still in the exploration stage of the “two-track in one” mode. It is very urgent to find a fitting point between clinical work and professional knowledge learning (Chao et al., 2019).

At the same time, clinical skills are the key ability of clinicians in China, and the practice needs of postgraduates with professional degree of clinical medicine in China are still difficult to be met (Ma, 2023). Relevant (Liu et al., 2019) studies have found that under the “two-track in one” model, the clinical operation ability of postgraduates with professional degree in general surgery has been improved compared with before. However, with the continuous development of medical technology and the rapid development and popularization of laparoscopic

technology in the field of surgery, the requirements for clinical skills of postgraduates with professional degree in general surgery have also increased. In the United States, the basic training and assessment of laparoscopic surgery have become a routine training method for surgeons (Edelman, Mattos, & Bouwman, 2010). However, there is still a lack of standardized laparoscopic training and teaching system and process in China (Gu, Zhao, Wang, Yu, Lin, Zhao, & Cao, 2017). At present, it still needs a very long training period to master the laparoscopic technology. In the case of not receiving systematic operation training, the early involvement of laparoscopic surgery has a relatively high surgical risk (Huang et al., 2019). Therefore, under the dual-track model, it is worth further exploration to carry out the standardized training of laparoscopic simulation training for master of general surgery (Yang et al., 2018).

2.2. Lack of Training of Scientific Thinking and Innovation Ability

The “two-track in one” training mode is of great significance for further standardizing the depth and breadth of the standardized training of residents, but it also exposes the problem (Tao et al., 2023) of neglecting the cultivation of scientific research quality. In particular, professional degree postgraduates with dual identities should not only take into account the necessary conditions of academic training, but also complete the required content of professional degree postgraduates training. In this training program, most of the time spent on clinical work, but the time spent on scientific research was greatly shortened, which could not guarantee the quality (Wang et al., 2023; Wang, 2020) of scientific research quality training. Related research reports that the time for scientific research and innovation is a minority. And the vast majority of graduate students say that the cultivation of scientific research ability is reduced under the “two-track in one” mode (He et al., 2024). Compared with academic graduate students, most of them have not received formal research training, nor have they learned in research groups. Even if they have original ideas in scientific research, they have no time to participate in scientific research during the rotation period (Tang et al., 2015a). This is very different from the purpose of postgraduate training, which is not only detrimental to individuals, but also to the development of departments, hospitals, and even the national level of medical science and technology.

2.3. Heavy Academic Workload and Increased Psychological Pressure

The mental health problems of postgraduate students in clinical medicine have become increasingly prominent under the background of “double track integration” mode (Liu, 2019). On the one hand, the psychological pressure of professional postgraduate students increases sharply due to the high-intensity learning tasks. On the other hand, the social requirements for the quality of medical services continue to improve, and the requirements of hospitals and schools for students are also increasingly strict (Wang, Lai, Liu et al., 2024; Gao, Li, Zhan, Ma,

Ma, Yang, & Liu, 2019). A survey conducted in Dongzmen Hospital Affiliated to Beijing University of Chinese Medicine in 2014 showed that nearly 80% of the students had different degrees of physiological dysfunction (Tang, Tian, & Yang, 2015b). Similar studies conducted in other parts of the world also showed similar results (Dres et al., 2023). Obviously, under the “two-track in one” mode, the medical professional master is in a sub-health state, and there are different degrees of psychological and even physiological problems. The above results suggest that the mental health problems under the “dual-track in one” training model, are still facing difficulties in the current training of clinical medical students (Wang, Lai, Liu et al., 2024).

3. To Explore the Cultivation of Professional Ability of Professional Postgraduates in General Surgery

Under the “dual-track in one” model, the standardized training of general surgery postgraduates is an important period for the growth of doctors. This model requires not only familiar with the basic theory of the profession, proficient in clinical skills, but also the basic methods of clinical research closely combined with clinical practice. Therefore, on the basis of laparoscopic simulation training, combined with “ChatGPT” virtual technology and literature reading, this model is proposed to carry out the joint training of postgraduates in general surgery. In order to cultivate residents’ ability to summarize clinical problems, to evaluate applied literature, to expand the field of medical knowledge, and to exercise the practical skills of postgraduates in general surgery. The quality of standardized training for residents can be better improved.

3.1. To Explore the Application of Laparoscopic Simulation Training in the Standardized Training of General Surgery Residents

With the development of medical technology, especially the promotion of minimally invasive technology, the traditional teaching model has been unable to meet the needs of modern medical teaching. Laparoscopic surgery is a safe, minimally invasive and quick recovery surgical method, and the teaching of its operation skills is particularly important for the training of clinicians (Zhang et al., 2024). However, surgery is a high-risk operation that requires the operator to have some experience. Therefore, providing an immersive way to simulate the real surgical environment allows surgeons to perform safer and more realistic surgical simulation, which has become a necessary way to cultivate high-level medical professionals.

In recent decades, the role of simulation teaching in laparoscopic training has been widely recognized by scholars at home and abroad. Laparoscopic simulation training is a valuable teaching method, which provides practice skills without causing harm to patients, and is an important mode (Ling et al., 2023) for general surgery master’s students to acquire laparoscopic skills. According to the current situation in China, there are three main methods of laparoscopic simulation

training: laparoscopic simulator, virtual laparoscopy and large animal surgery. Most of the hospital bases choose laparoscopic simulator, which has a certain significance for the improvement of laparoscopic surgery skills of residents. It is simple and easy to use, and suitable for the students (Jin, Zhang, Sun, Meng, He, & Na, 2014; Ding, Zhao, Gao, & Zhang, 2019) who have weak foundation of laparoscopic surgery and first contact with laparoscopy. The simulator training can simply simulate the abdominal environment, train the ability of basic cutting, suture and knot tying, train the hand-eye coordination in the process of laparoscopic operation, further master the role of laparoscopic surgical instruments, and understand the “lever operation” principle in laparoscopic operation. However, there is a certain gap between the model and human tissue, and this method cannot simulate the real surgical environment. VR (Virtual Reality, VR) technique through multimedia digital technology combined with the Virtual simulation technology, to create a vivid and visual, touch and hearing of the trinity of digital simulation technology environment (Liu & Duan, 2023). Xue et al. (2021) showed that VR technology provides an innovative immersive learning environment in contemporary medical education. It is imperative for teaching hospitals to explore and promote VR technology in the training of clinical skills to improve their comprehensive competitiveness. According to the latest research, under (Zhu, Bi, Cui, & Zhang, 2021; Lamblin et al., 2020) the virtual simulation laparoscopic surgery training, it can significantly improve the laparoscopic technical level of doctors and reduce the incidence (Spiliotis, Spiliotis, & Palios, 2020) of complications in the hands. It is obvious that the exploration of VR technology in clinical skills teaching has great potential and can produce significant clinical value (Ling et al., 2023). The virtual simulation teaching system can simulate the real situation of common clinical diseases, allow students to repeat the operation, and allow the occurrence of intraoperative errors, so that students can perform laparoscopic surgery within the allowed range without pressure, arouse students’ interest in surgery learning, and improve their basic operation ability of minimally invasive surgery (Zhong et al., 2021). Related studies have found that large animals simulation laparoscopic surgery play a key role (Li et al., 2016) in the training, it simulates the operating room environment, and live animals for anesthesia surgery, closer to the clinical, can significantly improve the level of physician surgery. In addition, in order to evaluate the effectiveness of the course, the laparoscopic skill level of residents before and after the course should be objectively evaluated (Huang, Tang, Li, Deng, Xu, & Wei, 2023). OSATS score is a common scale for the objective evaluation of external science and technology, and its evaluation criteria include respect for patient tissue, operation efficiency, instrument knowledge, instrument operation level, operation fluency, etc. (Elessawy et al., 2021). At the same time, laparoscopic skills competition can be carried out on this basis to promote learning and promote the enthusiasm of trainees.

Therefore, the introduction of new technology and new methods is an inevitable development trend in the process of resident standardized training in clinical skills training and teaching. Surgical operation training is often combined with

clinical work. Students can complete the training of basic clinical skills by simulating the real clinical operation process, effectively reduce the possibility of medical errors in clinical operation, and lay a solid (Ye, Lin, Zhang, He, Lin, & You, 2024) foundation for general surgery clinical work. Although many training institutions in China have realized the importance of laparoscopic teaching, there are still a series of problems to be solved to ensure the effective implementation of laparoscopic simulation teaching in the standardized training of residents.

3.2. Application of “ChatGPT” Virtual Technology in Resident Training of General Surgery

It is now in a new era of rapid technological innovation, especially driven by the development of AI technology. ChatGPT is a large language chatbot program released by OpenAI in the second half of 2022 that can converse by understanding and learning human language, and also has the function (OPEN AI. ChatGPT, 2022) of interacting according to the chat content. Cloud classroom, cloud ward round and other scenario applications based on virtual reality technology will be widely implemented, but the application of “ChatGPT” virtual technology in general surgery resident training education has not yet been paid attention by scholars. Due to the particularity of medical teaching, under the circumstances of limited resources of clinical practice courses, high teaching risk and limited clinical medicine teaching, the traditional teaching methods have certain shortcomings in cultivating the clinical thinking ability of standardized training students. First of all, researchers found that ChatGPT can not only be used to score papers, quickly form classroom tests, arrange personalized learning plans, provide learning materials, form qualitative or quantitative feedback, strengthen and supervise learning, but also generate case scenarios for situational simulation training (Khan et al., 2023). Secondly, Jiang Wei et al. found that ChatGPT was of great help to doctors in providing medical knowledge, explaining professional terms, formulating teaching tasks, and providing practical guidance, which was worthy of further promotion in medical education (Jiang, 2024). Due to the nature of the surgeon’s work, the clinical work of the teachers is relatively busy, and the teaching tasks should be taken into account at the same time. In the case of insufficient time, ChatGPT can be used as a virtual assistant to provide cases, teaching plans and other materials, so as to save the time for teachers to prepare lessons, so as to improve the quality and effect of resident training teaching. Finally, Sabry Abdel-Messih M et al. (Sabry Abdel-Messih & Kamel Boulos, 2023) also had a conversation with ChatGPT and found that ChatgPT could help doctors to clear the blind areas of knowledge in the field of poisoning, thereby reducing the missed diagnosis and misdiagnosis of rare diseases. Therefore, students can ask questions about the problems encountered in clinical practice through ChatGPT conversation, and then further summarize the knowledge points, so as to form a complete diagnosis and treatment idea to gradually solve the difficult problems of the disease under the guidance of senior doctors. In summary, under the “two-track in one” mode, the virtual reality technology teaching mode after the introduction of

ChatGPT will provide personalized professional answers for residents, continuously improve clinical thinking, and further help to build a complete professional knowledge system.

3.3. The Role of Professional Related Literature Reading in the Standardized Training of General Surgery Residents

Rapid progress in the development of modern medical technology, professional knowledge and the treatment method to update the iteration speed, professional knowledge is the most rapid and simple method is to read professional literature, in the general surgery of resident standardization training learning plays a very important position, especially the international latest reading English literature is to know the latest progress and achievements of the most common way (Yu, Qi, & Wang, 2024). Medicine is a subject that combines clinical and scientific research. With the rapid development of medical technology, the ability to read literature has become a necessary skill (OPEN AI. ChatGPT, 2022) in the process of personal development. First of all, the relevant research results show that the clinical case report literature has the characteristics of typicality, representativeness, particularity and rigorous clinical reasoning (Lin & Zhang, 2019). The application of the obtained clinical case report in the teaching of resident doctors can make up for the limitation of the medical level of the resident training base. Through literature review, report, supplemented by discussion, students can not only improve their logical thinking ability and on-site strain capacity, but also enable them to obtain the most cutting-edge medical knowledge in clinical practice and understand the disease problems that need to be solved in clinical practice (Zheng et al., 2023). Secondly, according to the current situation of standardized residency training in China under the “two-track in one” mode, we can promote the teaching model of journal meeting based on literature reading. In this teaching model, the literature data were scientifically selected, and the literature report PPT was made under the guidance of the teacher. The PPT report mode of the students in the department staff meeting improved the ability of data analysis and arrangement, PPT production and speech ability. Therefore, they can not only understand the latest progress of medicine in their own specialty and interest field, but also greatly help to improve the comprehensive quality of standardized training doctors, and they can confidently and appropriately integrate the knowledge into clinical practice (Qu et al., 2021). In conclusion, under the “two-track in one” mode, literature reading should be introduced into the standardized training of general surgery clinical medicine postgraduates. By using the network of the information age and consulting a large number of domestic and foreign literature, a comprehensive understanding of the latest frontier of a disease in this field can be found in clinical diagnosis and treatment innovation. It can also continuously improve the professional skills and literacy of the students (Yang et al., 2020). In the process of literature research, students can expand their knowledge, master the new progress and new trends of academic research, and cultivate their ability

of independent learning and scientific research thinking, and stimulate their desire to explore knowledge.

3.4. The Cultivation of Scientific Research Thinking and Ability of Clinical Professional Postgraduates in General Surgery

With the continuous progress of medicine, the modern medical system pays more and more attention to the role of scientific research ability in the training of professional postgraduates. Scientific research ability is not only a key component of the personal career development of residents, but also an important driving force to improve the quality of medical services and promote medical innovation. It is essential for professional postgraduate students to cultivate innovative scientific research thinking under the dual-track model (Qu, Wei, & Zhang, 2023). However, in today's "dual-track" training scheme, the demand for innovative talents, must adapt to the medical field to strengthen residency combined with the clinical and scientific research of teaching mode. First of all, it is necessary to clarify the connotation of the combination of clinical practice and scientific research. The implementation of the combination of clinical practice and scientific research teaching model requires the construction of a reasonable teaching system. This includes but is not limited to the establishment of teaching methods such as problem-based learning (PBL) and case teaching method, as well as encouraging residents to conduct research design, data analysis and paper writing through clinical practice. This model can effectively combine clinical practice with scientific research innovation, not only improve the quality of medical services, but also promote the improvement of scientific research level (Li, Li, Wan, Sun, & Du, 2021; Deng & Hu, 2022). Secondly, for the lack of systematic research training for clinical postgraduates, a variety of ways can be provided to make up for it. For example, we can set up scientific research special training courses, carry out academic reports and expert lectures, encourage graduate students to actively participate in scientific research projects, cultivate graduate students jointly with teachers who have scientific research projects, and open subject laboratories to students (Chen, Huang, Huang, & Xue, 2020a; Wang, Li, & Wang, 2021). Hospitals can create conditions to encourage clinical postgraduates to actively participate in experiments and implement "dual-track" training of scientific research ability, that is, to closely combine theory with practice and accumulate valuable experience (Li & Wang, 2021). Finally, a scientific evaluation system should be established to comprehensively evaluate the scientific research ability of residents (Zhang, Yang, Zhao, & Liu, 2019). The evaluation system can guide the scientific research training of residents in a more targeted manner and promote the improvement of their scientific research ability. In conclusion, in the process of scientific research training, we can learn from the experience at home and abroad, and adjust the strategy constantly in practice, so as to gradually find out the best path for the scientific research education of general surgery postgraduates in China (Xu, Li, Li, Sun, & Feng, 2023).

4. Summary

In summary, on the basis of laparoscopic simulation training, combined with ChatGPT virtual reality technology and literature reading and learning, this model not only helps general surgery master's students to establish a complete professional knowledge system, but also accumulates solid clinical professional knowledge and lays a solid foundation of clinical skills and scientific research capacity for the future. However, in order to achieve the training goal of general surgery, students under the "two-track in one" model establish a scientific research and teaching system suitable for clinical practice, so that students can complete the established scientific research task process while reaching the professional clinical level under the limited time arrangement, and it is still necessary to continuously optimize the clinical skills training mode of general surgery in the standardized training process. At present, the "two-track in one" model of general surgery in China is still in the stage of exploration, and needs to be constantly improved in the process of practice, so as to provide new ideas for speeding up the construction of a standardized general surgery medical talent training model. In summary, the resident training teaching under "two-track in one" system should keep pace with The Times, follow the conventional training program, and fully develop and utilize the potential resources around, so as to make the resident training teaching more colorful and effective.

Funding

Innovation Project of Guangxi Graduate Education (JGY2024328): Research on the structure and promotion path of graduate students' entrepreneurial ability in medical colleges under the background of new medicine.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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