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Exploration of Ideological and Political Education in the Clinical Pharmacology Course for Postgraduate Medical Students in the AI Era

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Abstract: In the era of AI, the cultivation of medical master's students faces new challenges and opportunities. As an important course in the medical field, clinical pharmacology holds significant value in integrating ideological and political education into its curriculum. This paper explores the background and motivations for incorporating ideological and political education into clinical pharmacology teaching in the AI era, analyzes the potential integration of patriotic education and medical ethics education as ideological elements, and proposes corresponding teaching approaches and methods. The aim is to cultivate medical homo sapiens talents with noble medical ethics, a strong sense of social responsibility, and innovative spirit.

Keywords: Clinical pharmacology; Course-based ideological and political education; Master of Medicine

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1. Introduction

With the widespread application of artificial intelligence technology in the medical field, the training environment for master's degree students in medicine has undergone profound changes. Clinical pharmacology serves as a bridge course connecting fundamental pharmacology with clinical practice, which is crucial for the professional growth of master's degree students in medicine [1].

Course-based ideological and political education, as an educational concept and method with contemporary and scientific characteristics, emphasizes subtly guiding students to establish correct worldviews, outlooks on life, and values during the process of knowledge transmission, integrating ideological and political education into every aspect of course teaching. In the AI era, exploring course-based ideological and political education in clinical pharmacology has significant practical significance. For instance:

(1) It helps to cultivate medical master's students with both professional competence and moral integrity. In the AI-driven medical environment, students are not only required to master advanced pharmacological knowledge and clinical skills but also need to have a high level of ethical awareness and social responsibility. By integrating ideological and political education into clinical pharmacology courses, students can be guided to understand the social significance and ethical responsibilities of medical work during the learning process, thus forming correct professional ethics and values;

(2) It promotes the innovative development of medical education. The application of AI technology provides new teaching tools and methods for clinical pharmacology courses. Through the exploration of course-based ideological and political education, teachers can make full use of AI technology to create a more vivid, interactive, and personalized teaching environment, stimulating students' learning interest and initiative, and improving the effectiveness of ideological and political education;

(3) It contributes to the cultivation of high-quality medical talents for society. In the context of the rapid development of medical technology, society urgently needs medical talents who not only have solid professional knowledge but also possess noble medical ethics and a strong sense of social responsibility. The exploration of course-based ideological and political education in clinical pharmacology is precisely aimed at meeting this social need, cultivating more outstanding medical master's students who can contribute to the health cause of mankind.

2. The significance of ideological and political education in the clinical pharmacology course in the AI era

Artificial intelligence technology has been extensively utilized across various medical domains, including but not limited to medical imaging diagnosis, pharmaceutical research and development, and disease risk prediction, fundamentally revolutionizing conventional medical approaches. In this context, medical postgraduate students are required to not only acquire specialized knowledge and technical competencies but also develop appropriate value systems and ethical frameworks to effectively navigate the complex ethical dilemmas and legal issues arising in the AI-driven healthcare landscape [2].

The incorporation of ideological and political education components within the curriculum serves multiple purposes, where it cultivates students' humanistic qualities and sense of social responsibility, improves the overall educational effectiveness of clinical pharmacology instruction, and achieves seamless integration between ideological-political education and professional training. This integrated approach not only stimulates students' academic motivation and engagement but also significantly enhances the course's sophistication, innovation potential, and intellectual rigor, thereby preparing future medical professionals who are both technically proficient and ethically grounded.

The study of clinical pharmacology provides an exceptional interdisciplinary platform for seamlessly integrating ideological and political education into modern medical training programs. Pharmacology textbooks and course materials systematically incorporate abundant and well-documented patriotic educational resources that vividly showcase China's profound and extensive medical heritage accumulated over millennia. These carefully curated educational materials particularly emphasize and highlight the numerous groundbreaking contributions of ancient Chinese medicine to the advancement of global healthcare, which include but are not limited to several remarkable achievements.

For instance, they detail Hua Tuo's pioneering development and successful application of anesthetic powder (Mafeisan) in complex surgical procedures during the Eastern Han Dynasty, representing one of the earliest documented uses of surgical anesthesia in human history. Furthermore, these resources comprehensively document the rich historical evolution and continuous development of traditional Chinese medicine culture, tracing its origins, theoretical foundations, practical applications, and modern adaptations across a span of thousands of years of Chinese civilization. The materials also emphasize how these ancient medical innovations and practices have significantly influenced and contributed to contemporary medical science worldwide.

A notable example appears in the chapter discussing antimalarial drugs, which dedicates significant content to Professor Tu Youyou's Nobel Prize-winning discovery of artemisinin. This section not only recounts the scientific

achievement itself but also profoundly elaborates on the research methodology that combined modern pharmaceutical techniques with traditional Chinese medical wisdom. The textbook emphasizes how this case demonstrates the crucial importance of basing scientific research on China's actual conditions, deeply exploring the essence of traditional culture, and continuously improving original innovation capabilities in science and technology.

Through these concrete examples, the curriculum effectively cultivates students' national pride, strengthens their confidence in Chinese science and culture, and inspires their sense of mission to contribute to medical development. The materials also highlight how traditional Chinese medical knowledge, when combined with modern scientific approaches, can produce world-leading medical breakthroughs that benefit all humanity.

Within the framework of clinical pharmacology teaching, medical ethics education serves as an indispensable component that integrates ideological and political elements into medical training. When delivering theoretical lectures on antipsychotic medications, instructors can significantly enhance students' ethical awareness by incorporating detailed case analyses. These real-world scenarios vividly demonstrate the severe consequences that may arise from improper disclosure of patient information, including both the ethical violations and potential legal liabilities.

Through these case studies, students gain a deeper appreciation for the fundamental principles of medical confidentiality, the critical need to safeguard patient privacy, and the broader concept of protective medicine in clinical practice [3]. This approach not only reinforces professional standards but also cultivates a strong sense of responsibility among future medical practitioners.

Moreover, integrating medical ethics education into clinical pharmacology fosters an environment where students are encouraged to think critically about the moral dimensions of their actions. By engaging with complex ethical dilemmas, such as those involving informed consent or the prioritization of patient welfare, students develop a nuanced understanding of how ethical principles intersect with clinical decision-making. This educational strategy also emphasizes the importance of empathy and compassion in patient care, encouraging students to view patients not merely as medical cases but as individuals with unique needs and rights. Ultimately, the incorporation of medical ethics into clinical pharmacology teaching equips future healthcare professionals with the ethical framework necessary to navigate the challenges of modern medical practice, ensuring that they uphold the highest standards of integrity and patient-centered care.

In the process of pharmacology education, when introducing epinephrine as a representative classical medication, educators can particularly emphasize its critical application in emergency cardiac resuscitation scenarios. This teaching approach serves as an excellent opportunity to cultivate students' reverence for life, strengthen their professional commitment to healthcare, and inspire a deep sense of devotion to their future medical roles. By connecting pharmacological knowledge with real-life medical emergencies, students can more profoundly appreciate the sacred nature of medical practice, recognizing that their future work directly impacts human lives. Such pedagogical methods not only enhance students' understanding of drug mechanisms but more importantly, ignite their passion for patient care and reinforce their professional responsibility. Through these meaningful educational moments, students develop both the technical competence and the humanitarian spirit essential for becoming compassionate healthcare providers [4].

3. Approaches and methods for ideological and political education in the clinical pharmacology course in the AI era

By leveraging advanced artificial intelligence technology to systematically expand and optimize teaching resources, educators can significantly enhance the quality and effectiveness of ideological and political education. This comprehensive approach involves not only the intelligent collection and organization of diverse educational materials such as real-world case studies, instructional videos, and academic literature, but also the sophisticated analysis and categorization of these resources to ensure their relevance and pedagogical value. The integration of these AI-curated resources makes abstract political concepts more concrete and accessible, thereby strengthening the visual impact and persuasive power of the instruction.

Furthermore, the development of immersive virtual simulation experiments, particularly those focusing on specialized

biological subjects like the *Phoxinus phoxinus* subsp. *phoxinus* (a model organism in scientific research), provides students with unprecedented opportunities to engage in hands-on learning experiences. These meticulously designed simulations recreate authentic laboratory environments and clinical scenarios, enabling students to safely explore complex procedures such as drug treatment protocols and pharmacological interactions. Through repeated practice in these risk-free virtual settings, students can develop critical thinking abilities, refine their problem-solving techniques, and cultivate a stronger sense of professional responsibility - all of which are essential competencies for their future careers in scientific and medical fields. The combination of AI-enhanced resource development and virtual simulation training creates a robust, multidimensional educational ecosystem that bridges theoretical knowledge with practical application.

By carefully selecting representative clinical cases that incorporate ideological and political elements, educators can effectively guide students to deeply reflect on various ethical dilemmas, moral conflicts, and legal considerations commonly encountered in medical practice. This teaching approach not only enhances students' understanding of clinical knowledge but also significantly cultivates their critical thinking skills and problem-solving capabilities. For instance, when analyzing cases involving adverse drug reactions, instructors should systematically examine both the pharmacological mechanisms underlying the drug's action and the multifactorial causes contributing to the adverse reactions. Simultaneously, the discussion should comprehensively address crucial professional issues such as physicians' ethical responsibilities, proper medication management protocols, and the fundamental principles of patient rights protection, thereby providing students with a holistic perspective on clinical practice.

Implementing structured group discussions centered around current ideological and political hot topics within the curriculum serves as an effective pedagogical approach to promote active student engagement. These carefully moderated exchanges enable participants to articulate their viewpoints, challenge assumptions, and collectively deepen their comprehension of complex sociopolitical elements. Particularly valuable are discussions examining the multifaceted ethical considerations surrounding AI applications in pharmaceutical research, including but not limited to critical issues like patient data confidentiality, informed consent protocols, and the potential for systemic biases embedded within machine learning algorithms. Through such thoughtful discourse, students can develop a nuanced, well-informed perspective on technology ethics that balances innovation with social responsibility, while cultivating essential critical thinking skills applicable to their future professional endeavors.

To effectively strengthen teacher training in clinical pharmacology, it is essential to implement comprehensive professional development programs that focus on enhancing educators' ideological and political awareness along with their pedagogical skills. This can be achieved through organizing systematic workshops and specialized training lectures that provide in-depth guidance on curriculum-based ideological and political education. These training initiatives should not only help teachers thoroughly understand the fundamental concepts and practical methodologies of integrating ideological and political elements into their teaching but also equip them with advanced instructional techniques for seamless incorporation of these components. By participating in such targeted professional development activities, educators in clinical pharmacology will be better prepared to cultivate students' professional competence while simultaneously fostering their ideological and political development, ultimately contributing to the cultivation of well-rounded medical professionals who possess both technical expertise and strong moral values.

Moreover, establishing a collaborative learning community among clinical pharmacology educators can further amplify the impact of these professional development efforts. Through regular exchange of teaching experiences, sharing of best practices, and collective problem-solving, teachers can continuously refine their approaches to integrating ideological and political education into the curriculum. This collaborative environment not only promotes individual growth but also fosters a sense of shared responsibility towards nurturing students' holistic development. Additionally, incorporating feedback mechanisms and continuous assessment into the training programs will enable educators to gauge their progress, identify areas for improvement, and adapt their teaching strategies accordingly. Ultimately, by adopting a multifaceted approach to teacher training in clinical pharmacology, we can ensure that educators are well-equipped to guide students towards becoming competent and ethically conscious medical professionals.

4. Conclusion

In the rapidly developing artificial intelligence era, ideological and political education integrated into the clinical pharmacology course has become an increasingly crucial measure for cultivating well-rounded medical postgraduates. By systematically uncovering and extracting profound ideological and political elements embedded in the professional curriculum, and by adopting flexible, diverse, and innovative teaching approaches that combine traditional methods with modern technological means, we can effectively achieve the deep integration of ideological and political education with professional medical education. This comprehensive educational approach aims to cultivate a new generation of medical talents who not only possess solid professional knowledge and skills but also demonstrate noble medical ethics, a strong sense of social responsibility towards patients and society, as well as an innovative spirit and problem-solving capabilities.

Meanwhile, as AI technology continues to advance at an unprecedented pace and finds increasingly widespread applications in the medical field, we must persistently explore, research, and innovate teaching models and methods for ideological and political education. This continuous improvement is essential to meet the evolving demands of the new era and to make significant contributions to the high-quality development and modernization of medical education, ultimately fostering the cultivation of more outstanding medical professionals for our society.

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Disclosure statement

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