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Demand and Analysis of Clinical Research Curriculum in Medical Universities

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Abstract: *Objective:* To investigate the needs of medical students regarding clinical research curricula to provide scientifically sound offerings and cultivate their clinical research thinking. *Methods:* From June to October 2022, medical students at medical universities in Shaanxi Province were surveyed using online questionnaires. The survey covered their demographic information, awareness of their major, understanding of clinical research, and preferences for curriculum content. *Results:* A total of 341 valid questionnaires were analyzed. Medical students demonstrated a strong awareness of their majors but a relatively low awareness of clinical research. There was significant demand for clinical research courses, with preferences for professionally oriented (81.8%), market-oriented (100%), theoretically and practically integrated teaching (78.6%), and application-focused (73.0%) courses. *Conclusion:* Medical colleges and universities should align clinical research curricula with the actual needs of medical students and clinical practice. Reforms in curriculum design and teaching methods are essential to better prepare students for careers in public health.

Keywords: Medical college; Clinical research; Curriculum; Demand; Analysis

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1. Introduction

Clinical research is a scientific endeavor that focuses on studying the human body as a research subject, investigating aspects such as disease diagnosis, treatment, prognosis, etiology, and prevention. It encompasses clinical trials involving drugs and medical devices, as well as investigator-initiated studies among other types, making it a cornerstone of medical research and an essential process for translating medical research findings into practice. Investigator-initiated clinical research, in particular, represents a primary avenue for hospital scientists and technologists engaged in medical research. Conducting such research demands a solid foundation in clinical diagnosis, treatment skills, and comprehensive scientific research capabilities. Therefore, medical education aimed at cultivating professionalism and research skills among medical students must strike a balance between theoretical knowledge and practical application. This approach ensures the development of high-caliber medical professionals capable of adapting to the evolving landscape of medical science and technology,

thereby facilitating the clinical application of medical advancements.

However, the current landscape reveals a scarcity of clinical research courses offered by medical schools, with these curricula often receiving inadequate attention. Consequently, many medical graduates lack robust knowledge of clinical research upon completing their clinical training. There is thus an urgent need for systematic instruction in clinical research within medical school curricula. This paper analyzes the demand among medical students for clinical research courses through survey research, providing a foundational basis for the implementation of such courses in medical education.

2. Methods

2.1. Subjects of the survey

This cross-sectional survey employed convenience sampling to select medical students from various medical schools in Shaanxi Province. Conducted between June and October 2022, the survey utilized an online questionnaire to investigate students' preferences for clinical research curricula and related factors. Full-time medical students possessing mobile electronic devices and capable of independently completing the questionnaire were eligible for participation. Participants provided informed consent, while those demonstrating non-cooperation or incomplete questionnaire responses were excluded.

2.2. Recruitment and enrollment

Following the guidelines established by Professor Yan Yan in "Medical Statistics" [1], the sample size was determined to be 5–10 times the number of independent variables, resulting in a calculated sample volume of 180 individuals. To mitigate potential errors and enhance questionnaire effectiveness, the sample size was increased by 10%, resulting in a final cohort of 198 individuals.

The survey questionnaire was formulated and distributed in the form of a two-dimensional code via the "Jinshuju" online data platform. Before the formal survey launch, 20 preliminary questionnaires were distributed, revealing incomplete responses. Measures were implemented to restrict each IP address to one response and mandate completion of all items, thereby reinforcing the survey's scientific rigor and precision.

Healthy individuals over 18 years of age from five provinces in northern China were selected as the study cohort. A designated liaison officer was assigned to each province to disseminate information online within the community, detailing the survey's objectives, significance, instructions for completing the questionnaire, and notes on questionnaire completion. WeChat groups were established in each community for distributing and collecting questionnaires. Participants scanned and completed the questionnaires using the two-dimensional code, facilitating automatic online data collection.

2.3. Statistical analysis

Data analysis utilized SPSS 26.0 and Excel 2010, with qualitative data presented as frequencies and percentages (%).

3. Results

3.1. Demographic characteristics statistics

The questionnaires were distributed online through platforms such as social circles and WeChat groups, resulting in 341 valid responses. Among these, 70 cases (20.5%) were male and 271 cases (79.5%) were female. Regarding age distribution, 180 cases (52.8%) were 20 years old or younger, 131 cases (38.4%) were between

20 and 30 years old, and 30 cases (8.8%) were older than 31 years. The respondents were predominantly from programs such as public health, clinical medicine, pharmacy, and nursing, primarily consisting of specialists and undergraduates, as detailed in **Table 1**.

Table 1. General information on survey respondents [*n* (%)]

Item	*n*	%	Item	*n*	%
Gender			Highest education		
Male	70	20.5%	Undergraduate	234	68.5%
Female	271	79.5%	Master's	25	7.3%
Age			Ph.D.	1	0.3%
< 20 years old	180	52.8%	Other	81	23.8%
21–30 years old	131	38.4%	Major		
31–40 years old	30	8.8%	Clinical medicine	75	22.0%
> 41 years old	0	0	Pharmacy	40	11.7%
Occupation			Nursing	31	9.1%
Student	292	85.6%	Public health	130	38.1%
Working	49	14.4%	Other	65	19.1%

3.2. Understanding of major

Personal understanding and selection of university majors significantly impact future career paths. Before choosing their majors, 53.7% of respondents had a strong understanding, 41.3% had a moderate understanding, and only 5.0% had little or no understanding of their majors. Additionally, 57.2% of students recognized their training would combine theory and practical skills for post-graduation medical and related work. A significant 85.0% believed their courses would greatly benefit their future careers, boosting their learning enthusiasm during their academic years. Moreover, 91.4% expressed confidence in their employment prospects, with 69.5% believing their courses would help secure satisfactory jobs. However, some students noted room for improvement in the curriculum's relevance to future employment needs, as outlined in **Table 2**.

Table 2. Cognitive status of survey subjects towards their majors [*n* (%)]

Item	*n*	%
The level of understanding of the major studied before choosing a major		
Very familiar	20	5.9%
Moderately familiar	163	47.8%
Slightly familiar	141	41.3%
Not at all familiar	17	5.0%
Evaluation of the major's training objectives		
Theoretical	47	13.8%
Skills	99	29.0%
Composite	195	57.2%

Table 1 (Continued)

Item	*n*	%
The degree to which the courses learned will be helpful for future learning and employment		
Very high	85	24.9%
High	205	60.1%
Low	46	13.5%
Very low	5	1.5%
Perception of employment prospects		
Good	129	37.8%
Common	184	54%
Not good	21	6.2%
Unclear	7	2.1%
Perceived job relevance of college courses		
Strongly relevant	60	17.6%
Relevant	177	51.9%
Not relevant	66	19.4%
Unclear	38	11.1%

3.3. Awareness of clinical research

Clinical research integrates theory and practice to address clinical challenges, serving as a critical research method for medical professionals. However, only 7.0% of students reported having substantial knowledge of clinical research, while the majority possessed limited or no understanding. A notable 78.3% expressed interest in having clinical research offered as an elective course, with 83.6% willing to actively participate. Most students expressed a strong willingness to integrate theoretical knowledge with clinical practice and research, anticipating its practical application in future clinical settings, as detailed in **Table 3**.

Table 3. Cognitive status of survey subjects towards clinical research [*n* (%)]

Item	*n*	%
Knowledge about clinical research/drug clinical trials		
Very familiar	8	2.3%
Moderately familiar	16	4.7%
Slightly familiar	121	35.5%
Not at all familiar	196	57.5%
Perception on the necessity of offering clinical research courses as elective courses		
Necessary	267	78.3%
Not necessary	16	4.7%
Unclear	58	17.0%
Willingness to choose clinical research as an elective course		
Willing	285	83.6%
Not willing	10	2.9%
Unclear	46	13.5%

3.4. Requirements for clinical research courses

Adapting to societal and economic demands necessitates curriculum reform. A significant 58.4% of students advocated for the introduction of new elective courses within their majors. The majority expressed a preference for career-oriented (81.8%), market-relevant (100%), integrated theoretical and practical (78.6%), and application-focused (73.0%) elective courses. These courses are seen as crucial for enhancing employability, fostering scientific research acumen, supporting job placement, and laying a robust foundation for future academic and professional endeavors, as summarized in **Table 4**.

Table 4. Survey respondents' demand for clinical research courses [*n* (%)]

Item	*n*	%
Opinion on the need for offering new elective courses in your major		
Necessary	199	58.4%
Not necessary	71	20.8%
Unclear	71	20.8%
Preference for the focus of new courses to be offered		
Theoretical	37	10.9%
Application-based	249	73.0%
Unclear	55	16.1%
Opinion on adding career-oriented courses to improve employability		
Necessary	279	81.8%
Not necessary	22	6.5%
Unclear	40	11.7%
Perception of the content of these courses		
Should closely follow the market, including the latest knowledge and skills required for future careers	111	32.6%
Practical knowledge should be the main focus, allowing for learning practical skills	111	32.6%
Provides assistance in finding a job and lays the foundation for future job changes	119	34.9%
Preference for the teaching approach of these courses		
Theoretical teaching as the main focus	17	5.0%
Focusing on practical teaching	46	13.5%
Emphasize both theoretical and practical teaching	268	78.6%
Unclear	10	2.9%

4. Discussion

4.1. The embarrassment of medical students not understanding clinical research-related knowledge

The construction of the National Clinical Medical Research Center began in 2013. As of October 8, 2022, the country has established 50 national clinical medical centers, covering 20 disease fields such as cardiovascular disease, neurological disease, chronic kidney disease, and malignant tumors. The Clinical Medical Research Center is an important initiative for promoting the overall development of medical technology in China and accelerating the clinical transformation and popularization of medical technology achievements. During the

14th Five-Year Plan period, the country will build around 120 provincial-level regional medical centers, focusing on improving the layout of chronic diseases and common diseases, achieving full coverage of major disease fields and clinical specialties, integrating clinical medical research resources and research forces, and designing and deploying according to the innovative full chain. The focus will be on clinical evidence-based, translational application, application promotion, and prevention and control strategy research, conducting 20–30 disease population studies with a population size of over 10,000 people, developing 50–80 comprehensive disease treatment plans, and researching and formulating no fewer than 15 international-level clinical practice guidelines.

With the support and layout of national policies, clinical research in China has developed rapidly. In recent years, Chinese medical researchers have published an increasing number of clinical research papers in top international journals such as The New England Journal of Medicine, The Journal of the American Medical Association, and The Lancet, attracting the attention of medical scientists worldwide. In clinical practice, young medical staff will encounter many clinical problems. Besides referring to relevant diagnosis and treatment guidelines, solving many clinical problems that do not have a unified industry reference has become a major challenge in clinical diagnosis and treatment. To address this difficulty, medical staff need to design clinical research plans based on clinical problems and verify them through clinical trials. If clinical medical staff lack relevant clinical research knowledge, scientific research thinking, and use diagnosis and treatment methods and medications that have not been verified through clinical trials, it is more likely to cause misdiagnosis and mistreatment, leading to various doctor-patient disputes and damaging the safety and rights of patients.

4.2. Exploration of teaching reform in clinical research as an elective course

This study conducted a survey and analysis from four aspects: general information of survey subjects, awareness of their major, awareness of clinical research, and demand for curriculum design. The research results showed that 95.0% of medical students had a certain understanding of their major before choosing it; the vast majority of medical students believe that their courses are very helpful for employment (85.0%), that their future employment prospects are good (91.4%) and that they can find a job they are satisfied with (69.5%).

Only 7.0% of medical students are aware of clinical trial/research-related knowledge, while the vast majority are unclear or have little knowledge about clinical research. The main reason is that most medical schools do not offer clinical research/trials as an elective course, and only a few schools offer it as an elective. The promotion efforts are insufficient, and the clinical research curriculum is inadequate. Research revealed that Beijing Union Medical College offered clinical research-related elective courses in 2021, which were welcomed and recognized by medical students [2]. Additionally, some hospitals have temporarily opened training courses related to clinical research, such as Tangdu Hospital of the Air Force Military Medical University, People's Hospital of the Xizang Autonomous Region, and Cancer Hospital of the Chinese Academy of Medical Sciences [3-5]. However, these training programs are aimed at medical workers, not medical students. Research has shown that 80.00% of healthcare workers are very eager or quite eager for hospitals to offer clinical research training courses. The main problems they face are insufficient professional knowledge and skills in topic design (86.07%) and the selection of statistical analysis methods (73.36%). Medical students do not have other channels to obtain relevant knowledge and rely only on senior students engaged in related business to obtain information. 58.4% of medical students believe that their major should offer new elective courses, 78.3% are willing to make clinical research an elective course, and 83.6% are willing to take it.

The traditional classroom teaching method is limited, the content is boring, and it is difficult to mobilize students' enthusiasm for learning. The survey results show that the vast majority of medical students hope that

the newly opened elective courses have career orientation, meet market demand, and emphasize both theoretical and practical teaching. Therefore, it is recommended to change the teaching form of clinical research courses to classroom teaching combined with project practice. Medical students should apply what they have learned in the classroom to the implementation of clinical research projects, participate in assisting the teaching teacher in collecting case data, observing the informed consent process, and other aspects. This approach effectively applies theory to practice, deepening the understanding and mastery of theory.

5. Conclusion

With the improvement of China's technological innovation capabilities, clinical diagnosis and treatment are becoming increasingly standardized, and the demand for clinical research is also increasing. Therefore, it is necessary for medical students to understand and master the relevant knowledge of clinical research. Based on this, medical colleges should reform clinical research courses and teaching methods according to market demand and social development needs. This reform should be combined with the needs of clinical work and the public's actual need for standardized medical care to cultivate comprehensive and high-quality medical students.

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Disclosure statement

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