



Current situation and improvement strategy of postgraduate training in Clinical Pharmacy

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[Abstract] In the context of the Healthy China initiative, this study outlined the current situation of clinical pharmacy education in China and analyzed the major impediments in postgraduate professional degree programs in clinical pharmacy to the fulfillment of the needs of the rapid progress in China's medical and health sector and to the swift and effective improvement of the development of high-level clinical pharmacy talents. These problems are illustrated by indefinite training objectives, the lack of standardized training criteria, and the failure to change the mindset of pharmacy education and have resulted in an incomplete knowledge system and a disconnect between the training objective and the needs of society and the pharmacy industry. Therefore, the graduates as clinical pharmacists are not professional enough, with inadequate social recognition. This study advocates that educators should change the education philosophy, come up with innovative approaches toward talent training for postgraduate professional degrees in clinical pharmacy, accelerate the effective connection between talent training and registered qualification, and nurture the quality of humanism. This way, high-level talents of clinical pharmacy will be prepared, who can then cater to the needs of society and the pharmacy industry.

[Key words] Clinical pharmacy; Postgraduate professional degree; Talent development; Innovative training approaches

1 Introduction

Clinical pharmacy is an interdisciplinary subject between pharmacy and clinical medicine, which involves the provision of patient care. It is committed to training pharmaceutical professionals who have basic knowledge and

skills of clinical pharmacy, can study and initiate clinical pharmacotherapy, can promote the rational use of drugs, and can improve the quality of medical service. According to the Specification of Pharmacy Administration in Health Facilities jointly issued by the National Health and Family Planning Commission of the People's Republic of China (PRC) and the National Administration of Traditional Chinese Medicine in 2011, medical institutions should build a clinical treatment team that includes doctors, clinical pharmacists, and nurses to promote the rational use of drugs. It emphasizes that there must be five or more clinical

[Research funding] This work was supported by Innovation Initiative Program of Guangdong Postgraduate Education (Key Program) (No.2017JGXM-ZD20); "Innovative School Project" Program of Postgraduate Education of Guangdong Pharmaceutical University.

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These authors have no conflict of interest to declare.

pharmacists in a tertiary-level hospital and three or more clinical pharmacists in a secondary-level hospital^[1-2]. Although the regulatory authorities set forth such requirements for the number of clinical pharmacists, to date, few health facilities have fulfilled the requirements in letter and in spirit. Major problems include the lack of excellent clinical pharmacy professionals, the generally poor capability of clinical pharmacists, a majority of health facilities lacking the initiative to improve pharmacy service, and the insufficient social recognition of clinical pharmacists.

A professional degree helps students prepare for careers in specific fields. Such programs, developed on the basis of the characteristics of this specialty, focus on imparting training in practice and application techniques, and highly capable postgraduates with academic and hands-on knowledge are developed. This highlights the combination of academic knowledge and professional skills. After obtaining a degree, most of the students practice a profession in particular fields. Clinical pharmacists of quality in China and other countries are primarily postgraduates with professional degrees in clinical pharmacy. To train highly capable and high-level clinical pharmacy talents who can meet the needs of society and the pharmacy industry, we should investigate the patterns of clinical pharmacy training; analyze the current condition and shortcomings of clinical pharmacy education; and develop possibly effective improvement strategies to improve, and create innovations in, training approaches toward a postgraduate professional degree in clinical pharmacy.

2 Current conditions and shortcomings of china's postgraduate professional degree training in clinical pharmacy

In the 1950s, the medical and pharmaceutical community across the world initiated attempts and explorations regarding clinical pharmacy

education. Doctor of Pharmacy (PharmD) education, which is exemplified by the US and other Western countries, has become mainstream, highly respected, and imitated in the world^[3]. In contrast, China's clinical pharmacy education was initiated late, approximately around the end of the 1970s. In 1987, the State Education Commission of the PRC added clinical pharmacy as a pilot major to a catalog of undergraduate majors of higher education institutions. Some universities in China started offering postgraduate programs in clinical pharmacy in 2002^[4]. Currently, in China, clinical pharmacy is a second-level discipline (research area) that is subsumed under the first-level discipline "pharmacy." A professional degree in clinical pharmacy does not cover doctorate. In general, clinical pharmacy is still an emerging discipline in China, without structured training programs for preparing high-level talents. The current conditions and shortcomings are detailed as follows.

2.1 Theory-focused professional degree, pharmacy-emphasized clinical pharmacy, and professionalism-neglected training program

Clinical medicine has been included in the curricula of postgraduate professional degrees in clinical pharmacy in many universities in China. However, clinical pharmacy is still transitioning from "chemistry mode" to "chemistry–biology mode" owing to the fewer class hours of clinical medicine^[5]. If clinical pharmacy is established in medical universities, clinical medicine courses will be strong and courses on chemistry and pharmacy will be weak. If clinical pharmacy is established in comprehensive or pharmaceutical universities, courses on drug development will be emphasized instead of clinical medicine^[2] for current clinical pharmacy education in China. Some medical universities have adopted a pedagogical approach: a combination of theoretical learning and experiential

learning. However, research capability is still the principal objective of education, and the quality of academic papers is considered to be the assessment criterion. No significant differences in educational training exist between postgraduate professional and academic degrees in clinical pharmacy, and most of them belong to the academic degree training mode. Students are awarded Master of Science (MS), Master of Medicine (MMed), or PharmD. The syllabus stipulates that postgraduates must have solid academic achievements. Thus, students have to spend much time doing basic research in laboratories and barely have time for practical training. Therefore, postgraduates of clinical pharmacy after graduation are usually ineligible to provide clinical pharmacy service, which is "oriented toward patients and cored toward rational use of drugs." They tend to have limited knowledge and poor ability. They can only conduct basic research and laboratory-based surveillance for the clinical use of drugs^[6]. They are inexperienced in reviewing and assessing prescriptions of dosing regimens for specific specialties, thereby failing to deeply engage in medical service and improve service for the clinical use of drugs. In a new situation faced by China, such an educational method falls short of the need to facilitate the development of clinical pharmacy talent education.

2.2 Disconnection of education and knowledge system between medicine and pharmacy: indefinite objective of professional preparation

Clinical pharmacy, as a highly professional, interdisciplinary subject, requires well-organized close integration between clinical medicine and pharmacy. Moreover, the integration includes the knowledge systems of both disciplines. A postgraduate student seeking a professional degree in clinical pharmacy should broaden their experience in long-term practice. They should

have intimate knowledge of the rational use of drugs against various diseases, meet individual patients' requirements for using drugs, and have a perspective on clinical drug treatment. A qualified clinical pharmacist should accurately and flexibly apply pharmacy knowledge when managing clinical diseases. They should be acquainted with relevant policies and regulations regarding pharmacy administration and formulate a scientific individualized dosage regimen for patients. Nevertheless, China's postgraduate professional degree in clinical pharmacy currently shows a long educational disconnection between medicine and pharmacy, which indicates the lack of effective association between both disciplines. Conversely, clinical pharmacy education in medical universities is biased toward the skills and procedures that are employed in diagnosis and treatment but emphasizes less on topics such as absorption, metabolism of drugs, drug-drug interaction, and identification of accurate and rational dosage. Alternatively, clinical pharmacy education in pharmaceutical universities focuses more on the training of research capability and academic thinking among postgraduate students. However, teachers impart less knowledge regarding the common issues related to the clinical use of drugs, such as the rational clinical use of drugs, toxicity and adverse effects of drugs, and accurate, individualized use of drugs. The disconnection between medicine and pharmacy results in the indefinite purpose of education, which severely compromises training quality.

The underlying reason is that top-level design was not considered when postgraduate training schemes were devised. Numerous universities borrow advanced schemes from foreign counterparts by providing courses of theory and practice, but they classify clinical pharmacy as a second-level discipline of pharmacy and simply do the addition of pharmacy plus medicine. In such

schemes, pharmacy lessons are prioritized and medicine courses are of only secondary importance. Both disciplines have not been integrated in a well-organized manner. In addition, students are drawn from a mix of academic backgrounds. Many of them do not have any knowledge of clinical pharmacy in the undergraduate years and are transferred to the major of clinical pharmacy during admission to postgraduate schools. Thus, the lack of coherence that exists between undergraduate and postgraduate education is telling. Furthermore, short periods, poor management, and incomplete assessment procedures are noticed during clinical pharmacy postgraduate internship. Students usually make perfunctory efforts during clinical internships. The mentors of graduates participating in professional degree programs in clinical pharmacy are mostly supervisors working on basic pharmacy research in schools. They are incapable of mentoring because of the lack of experience in clinical drug use. Because of multiple factors, students fail to appreciate and understand the true meaning of the rational use of drugs in clinical practice and only have rudimentary knowledge of diseases and drug use assessment. They find themselves shackled or rushed off their feet when doing jobs. Consequently, clinical internship becomes a mere formality and cannot meet the requirement of high-level talent development through a postgraduate professional degree in clinical pharmacy.

2.3 Talent development not geared to the needs of society and the industry, inadequate social recognition, and implicit characteristics of trained talents

Postgraduates seeking a professional degree in clinical pharmacy, as high-end talents, should focus on the fulfillment of social and industrial demands. The educational philosophy should be modified from previously "drug-oriented" into "patient-

oriented," which indicates that a clinical pharmacist should be a pharmacy service provider. This way, high-end professionals who have highly specialized skills and can quickly adapt to professions can be prepared. China's clinical pharmacist system is increasingly internationalized in response to people's increased standard of living; heightened awareness of fitness; aging and net growth of population; well-established rural cooperative medical schemes; and stricter requirements for medical care from the government and the public. Clinical pharmacists are expected by the public and government to provide effective pharmacy services through expertise. Postgraduates holding a professional degree in clinical pharmacy are far from being clinical pharmacists. Meng et al.^[7] investigated the pharmacy human resources and knowledge structure of 92 hospitals in Jiangsu Province. Clinical pharmacists have been found to account for only 5.4% of pharmacy professionals, which is almost equal to the proportion of administrative personnel. Moreover, only a minority of clinical pharmacists have a master's degree or above. Nowadays, clinical pharmacy in hospitals primarily involves "drug supply-oriented" support. Multiple graduates of clinical pharmacy work on drug dispensing. Some are only responsible for dispensing as per prescriptions, which is a waste of talents. It is difficult to form a talent pipeline of clinical pharmacy research if the role played by highly educated pharmacists of quality cannot be updated. This fact also fully reveals that the clinical needs cannot be satisfied with the use of existing educational methods concerning postgraduate professional degree programs in clinical pharmacy.

A majority of physicians have superficial knowledge of the pharmacy service provided by clinical pharmacists. Their attitudes toward this profession are often contradictory: welcome but still fraught with suspicion and rejection. They

are always confused regarding the clinical use of drugs but do not trust pharmacists. To solidly develop clinical pharmacy in China, relevant regulatory authorities have formulated laws and regulations to legalize and justify the profession of clinical pharmacists. However, strong legislation is still needed^[8]; otherwise several postgraduates holding this professional degree will hesitate to seek employment owing to inadequate recognition. Meanwhile, clinical pharmacy personnel are hardly trusted by physicians and patients when providing clinical service; thus, both are uncooperative at times, which adversely affects the quality of pharmacy service, thereby hindering the progress in the discipline of clinical pharmacy. Under such circumstances, it is an enormous challenge to prepare high-level quality clinical pharmacy professionals through postgraduate professional degree programs in clinical pharmacy.

Clinical pharmacy is a "human-centered," practice-dependent discipline. Postgraduates trained through professional degree programs in clinical pharmacy perform an essential role in holding dialogues with physicians and patients and offer guidance on the rational use of drugs in clinical practice. Thus, the quality of humanism should be nurtured during learning activities. These days, imparting knowledge professionally and learning skills practically are considered to be important in China's clinical pharmacy education; however, the quality of humanism (e.g., professional ethics and communication skills) and correct values are seldom instilled. Thus, when offering clinical service, graduates are unable to empathize with patients or address clinical problems. They have muddled clinical thinking, cannot convey accurate information to the patients, and have poor service consciousness and sense of responsibility. Therefore, valuable pharmacy service has not been provided.

3 Improvement of education strategy of postgraduate professional degree in Clinical pharmacy

3.1 Objective and mission of postgraduate professional degree programs in Clinical pharmacy

When clinical pharmacy education is provided, it is highly important to clarify the objective of postgraduate professional degree programs in this discipline. These programs are intended to prepare high-level versatile professionals who can participate in the design and implementation of a clinical drug regimen. They are highly capable of delivering clinical solutions; undertaking some research; and establishing effective communication, equipped as they are with the desirable quality of humanism and specialized therapeutic knowledge about the use of medications. The mission of such programs is to prepare clinical pharmacy professionals with highly specialized skills. Efforts should be made in the direction of improving students' sense of responsibility and consciousness of service. Apart from that, the following abilities should be nurtured: to handle the issues regarding the clinical use of drugs, to effectively communicate with patients, to think clinically, and to address practical problems. Such professionals can apply their knowledge of pharmacy and provide experimental evidence to solve tricky clinical problems. The requirements regarding the attainment of postgraduate education for pursuing a professional degree should be made less strict when compared with the requirements for pursuing an academic degree. Students should be assessed through the analysis of drug use in clinical cases, medical record norms, and relevant theories. Moreover, vocational education should be highlighted when postgraduates are educated to seek a professional degree. Clinical practice should be performed throughout the programs. Students

should also develop practical skills when learning theories and have specialized knowledge regarding the special use of drugs and relevant precautions. China and other nations have set the requirements for one to major in clinical pharmacy in the criteria of licensed pharmacist qualifications and have laid out assessment criteria for the postgraduate professional degree. On the basis of these rules and social needs, the syllabus and teaching plans should be developed, and "two certificates" (master's degree certificate and registered qualification certificate of a licensed pharmacist) should be determined as the objective of the programs. Educational and practical activities should be conducted under the guidance of educators to closely combine a postgraduate professional degree in clinical pharmacy with licensed pharmacist qualification.

3.2 Approaches to the training of postgraduate professional degree programs in Clinical pharmacy

3.2.1 Curriculum design

The curricula of clinical pharmacy undergraduate programs are mostly inclusive, and thus, they are superficial and unspecific and do not have future-oriented employment orientation. They are geared toward chemistry and pharmacy instead of clinical medicine. Only limited to liberal education, it does not help students to prepare for future careers. As an inevitable result, first-year postgraduate students are drawn from a mix of academic backgrounds, without a formalized system of knowledge. In addition, the curriculum design should be biased toward perspective and capability regarding clinical drug treatment rather than cramming-based crash courses of clinical medicine. In response to a mix of academic backgrounds and generally limited clinical knowledge, it is recommended that these professional degree program organizers learn from

the PharmD curriculum^[9] by offering common courses, clinical pharmacy lessons, and medicine-related subjects, with total academic credits of ≥ 24 scores. The curriculum design should incorporate common courses, such as political education and professional English; medicine-related subjects, such as diagnostics, evidence-based medicine, medical statistics, and medical ethics; and clinical pharmacy subjects, such as clinical pharmacotherapeutics, clinical pharmacology, evidence-based pharmacy, analysis of in vivo drugs and toxic substances, research of individualized drug administration and drug metabolism, use of drugs in special population, clinical assessment and rational use of drugs, pharmacogenomics, medicinal product information and literature evaluation, adverse drug reaction monitoring, epidemiology, pharmacometrics, pharmacy administration, and pharmacy-related laws. In addition, lessons in the humanities should be added to nurture students' quality of humanism by increasing their capability in terms of social behavioristics, professional ethics, and communication skills. Owing to the very limited study time for graduate-level theoretical courses, basic courses (such as pathophysiology and diagnostics among others, along with internal medicine, surgery, neuroscience, pediatrics, and obstetrics and gynecology) cannot be set as the standard of undergraduate education in clinical pharmacy. Postgraduate students should improve their proficiency in certain disciplines where they are lagging and develop the capability of independent lifelong learning, which may be supported by multiple pedagogical approaches.

3.2.2 Pedagogical approaches

The single teaching method of "spoon-feeding" adopted conventionally cannot cater to the needs of talent preparation these days. Active absorption and digestion should be considered the principal objective of pedagogy. Postgraduate students

are self-learners to some extent. "Diversified" pedagogical approaches motivate them to study, establish explicit goals, think creatively, and enable them to solve problems. Such approaches involve different ways of teaching, which are designed by instructors or university authorities in accordance with course content; teaching is further enriched by the full utilization of scientific means (e.g., multimedia). The approaches are exemplified by lecture-based learning, problem-based learning (PBL), case-based learning (CBL), and the integrated training approach (ITA)^[10-11]. Campus network resources can also be employed for video lectures (e.g., cloud classroom) on specialist theories so as to extend the limits of time and space. PBL assists students in enjoying the pleasure of knowledge acquisition and capturing the significance of knowledge application in the course of examining and solving problems. CBL emphasizes that teachers guide students with typical clinical cases on how to analyze and address practical problems through cooperation. The ITA integrates PBL with CBL. With the ITA, experienced specialists will be invited to present lectures that are pertinent to clinical pharmacy and to provide further guidance to postgraduate students and teachers of clinical pharmacy. "Diversified" pedagogical approaches allow students to more actively engage in class, take more interest in learning, and grasp and memorize what they have learned. Connections between "teaching and learning" and "learning and applying" are thus well-established. In addition, "diversified" pedagogical approaches can be an instrument to closely integrate three aspects: knowledge and capability; theory and practice; and expertise and quality. In clinical practice, instructors of universities or colleges may employ individualized pedagogical approaches involving "seeking common ground while shelving differences" by engaging students in case discussions and by exploring problems

pertaining to clinical pharmacy and (or) other disciplines.

3.2.3 Dual-supervisor system

A dual-supervisor system (for "pharmacy + clinical practice" purpose) should be formalized for postgraduate professional degree programs in clinical pharmacy, in which students are instructed both on the inside of and the outside of school. The academic background of pharmacy supervisors should be that of clinical pharmacy; it is desirable that a majority of them be professors with clinical practice experience and capability for scientific research. They are responsible for scheduling theory courses, nurturing scientific thinking, and instructing thesis writing and oral defense. Clinical supervisors, as pharmacists with considerable clinical experience, instruct students to conduct clinical practice and nurture clinical thinking; communication with healthcare professionals and patients; and the quality of humanism. Further, in the later stage of internship, when students have opted for a specialty, corresponding specialist pharmacists make supervisor teams and continue to train postgraduate students of clinical pharmacy in professional skills.

3.2.4 Humanistic education

In the context of striking progress in scientific technologies and the market economy, postgraduate students lack humanist values. In the process of scientific research, some pharmacy professionals lose sight of the human social nature and psychological factors but focus on research and development and the application of medication. Humanist values have not been nurtured. It is highly important to develop an educational philosophy of humanist concerns and empathy. Humanist education should underlie the postgraduate programs of clinical pharmacy, starting from admission to graduation. Educational purposes can

be differentiated into various stages for students of different grades on the basis of their mental status. To enhance the awareness of social service, in addition to the recognition of professional identity and a sense of responsibility, educators can also help postgraduate students to have dedication and a keen sense of social responsibility by engaging them in community activities (such as medical health service and health investigation)^[12]. During internships, students are particularly susceptible to the quality of humanism of clinical pharmacists and healthcare professionals. Therefore, students should be well instructed to respect the patient's personality and dignity; master communication skills; show concern toward patient quality of life, ideas about life, and way of life; and hear the patient's voice physiologically, psychologically, and sociologically. Students should translate theories into practice, hold more dialogues with physicians, nurses, and patients, and properly empathize with patients and their family members. They should strive to be more professionally virtuous, more cooperative, and more kind-hearted.

4 Conclusion

Postgraduate professional degree programs in clinical pharmacy have prepared batches of qualified graduates for the clinical pharmacy sector. The training quality is closely associated with the innovative capability and potential of the pharmacy industry. The policy of "Zero Medicine Markup" has been fully introduced, and the system of "covering hospital expenses with drug sales" has been abandoned. Against this backdrop, clinical pharmacy has been rapidly transformed from "pharmacy laboratory centered" to "clinical service centered." Medication is supplied in community pharmacies. The department of pharmacy in hospitals focuses on drug quality control, drug management, and research in clinical pharmacy and pharmacy. These transformations impose stricter

requirements regarding knowledge and skill training in postgraduate programs in clinical pharmacy and also necessitate close association between education and social needs. Clinical pharmacy does not only supply drugs and has now begun to assist physicians in the direct clinical care of patients by optimizing the use of drugs and improving patient quality of life. However, the number and quality of clinical pharmacy graduates trained by current programs fall short of social needs. Therefore, in postgraduate professional degree programs in clinical pharmacy, the traditional educational philosophy should be modified and approaches to training should be innovated by prioritizing intervention and assessment of education quality and concentrating on the needs of society and the individual development of postgraduate students. Only in this manner can the sound development of clinical pharmacy and individuals be promoted, development of clinical pharmacy talents be accelerated, social needs be met, the education mission be accomplished, and the ever-growing health needs of the Chinese people be fulfilled.

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