

## REVIEW

### Development and Current Status of Clinical Pharmacy Education in China

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**Objective.** To describe the current status and developing trend of clinical pharmacy education in China.

**Methods.** Descriptive analysis of data and information about the clinical pharmacy specialty, pharmacy colleges, and curriculum from literature, college websites, and statistics from the Ministry of Health (MOH) and Ministry of Education (MOE) websites was conducted.

**Results.** Clinical pharmacy programs were established in China in 1989 but developed more fully after 2006. In 2012, there were 30 pharmacy colleges with clinical pharmacy undergraduate programs, which included a bachelor's degree in clinical pharmacy and a clinical pharmacy concentration within the BS programs of pharmacy or medicine. More than 40 colleges within the university system offer 4 types of master's degree programs in clinical pharmacy. Five universities offer a PhD program in clinical pharmacy. Three postgraduate programs exist, which train hospital pharmacists and clinical pharmacists: the 3+2 year Hospital Pharmacist Standardized Training Program at Peking hospitals; the 1-year Clinical Pharmacist Training Program sponsored by the MOH; and the 2-year Clinical Pharmacist Residency Program provided by West China Hospital at Sichuan University.

**Conclusion.** A growing clinical pharmacy education system has been established and has become an important subfield in Chinese pharmacy education. Measures should be taken to further promote the development of clinical pharmacy education in China.

**Keywords:** Chinese clinical pharmacy education, Chinese undergraduate programs, Chinese graduate program, postgraduate

## INTRODUCTION

Chinese pharmacy education was initially designed to train pharmaceutical practitioners to work in industry or research.<sup>1</sup> In the past two decades, however, well trained pharmacists with clinical knowledge and skills have become urgently needed to meet the increasing demand for high-quality medical care. According to the Chinese Ministry of Health's Annual Health Statistics in 2011, there were 364,000 hospital pharmacists and pharmacy technicians in mainland China, serving 1.28 billion people, 21,979 hospitals and 918,003 primary medical institutions.<sup>2</sup> There were, therefore, an average of only 2.69 pharmacists per million people, and 16.6 pharmacists and pharmacy technicians per hospital. According to the paper *Regulation of Pharmacy Management in Medical*

*Institutions*, issued by the Ministry of Health (MOH) in 2011, pharmacists should make up no less than 8% of the total medical professionals in a hospital,<sup>3</sup> so the number of hospital pharmacists in China should be 610,000. This leaves a huge gap of 246,000 pharmacists to be filled in the immediate future. The MOH is working to establish standardized entry level criteria for clinical pharmacists via the Licensed Pharmacist Law,<sup>4</sup> and it is expected that only graduate students with at least a bachelor's degree in clinical pharmacy or pharmacy will be able to qualify as clinical pharmacists by passing a national examination. The focus on clinical pharmacy education is increasing, as it is the only system for training clinical pharmacists in China.

Clinical pharmacy education was first established in China in 1989, when the College of Pharmacy at the West Chinese Medical University (now known as West China College of Pharmacy, Sichuan University) offered the first 5-year clinical pharmacy bachelor's degree program.<sup>5</sup> Until 1999, there were at least 8 colleges that offered a 4- or 5-year clinical pharmacy bachelor's degree.

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However, in 1999, the Ministry of Education (MOE) canceled the clinical pharmacy program because a major review of bachelor's degree programs revealed too many obstacles in the process of establishing a quality clinical pharmacy program.<sup>6</sup> In 2002, however, the MOH realized there was a need for trained clinical pharmacists and issued a document on the provisional regulation of pharmacy management in medical institutions, which required pharmacy departments in hospitals to establish a pharmaceutical care program oriented toward patient care.<sup>7</sup> Driven by the increasing need for clinical pharmacists, the MOH set up the Clinical Pharmacist Training Program in 2006, which trained clinical pharmacists in qualified hospitals.<sup>8</sup> In the same year, the Chinese Pharmaceutical University was approved to establish a pilot clinical pharmacy bachelor's program.<sup>9</sup> Since then, other pharmacy colleges have also begun clinical pharmacy programs. With both graduate and postgraduate programs in clinical pharmacy, a more comprehensive pharmacists' training system has been established and is continuing to develop in China.

### Undergraduate Programs

According to the last Undergraduate Program Catalog issued by the MOE in 2012, there were 8 kinds of undergraduate pharmacy programs in China, which include Pharmacy, Pharmaceutical Science, and Traditional Chinese Pharmacy, and 5 relatively new ones, Clinical

Pharmacy, Pharmacy Administration, Pharmacy Analysis, Pharmaceutical Chemistry, and Ocean Pharmacy.<sup>10</sup> According to the MOH website, there were 218 colleges that provided undergraduate pharmacy programs in 2011. By the end of 2012, 30 colleges (13.8%) were offering a clinical pharmacy program across 19 of the 31 provinces in mainland China (Table 1).

Of these 30 colleges, 17 provided a clinical pharmacy bachelor's degree program (BPharm), which was formally approved by the MOE. The other 13 colleges provided a clinical pharmacy concentration as part of pharmacy or medicine degree. Clinical pharmacy concentrations can be established by the colleges themselves, whereas the BPharm program must be assessed by an affiliated university first and then assessed and approved by the MOE. Approval is based on demand of professionals, existing teaching resources, the reputation of the college, among other factors. In 2011, there were 13 applications from colleges wanting to begin degree programs, of which 6 were approved. The number of BPharm programs increased from 1 in 2006 to 11 in 2009, and to 17 in 2011.

Of the 17 formal clinical pharmacy programs, 16 awarded a BPharm degree and 1 awarded a bachelor's of science (BS) degree. Of 13 clinical pharmacy concentrations, 9 awarded BS degrees, and 4 awarded bachelor of medicine degrees because they were provided under medicine programs.

Table 1. Clinical Pharmacy Undergraduate Programs in China

Program/ Concentration	Type of Degree	Academic Years	Number of Colleges	Names of Colleges
Clinical pharmacy program	BPharm	5	16	Anhui Medical University; Chinese Medical University; Chinese Pharmaceutical University; Dalian Medical University; Fujian Medical University; Guangdong Pharmaceutical University; Harbin Medical University; Luzhou Medical College; Nanjing Medical University; Qiqihar Medical University; Shenyang Pharmaceutical University; Sichuan University; Wenzhou Medical College; Xuzhou Medical College
Clinical pharmacy concentration as part of pharmacy or medicine program	BS	4	1	Kun ming Medical University;
	BS	4	7	Beihua University; Hebie North University; Jilin Medical College; Nanjing TCM University; Southern Medical University; Suzhou University; Xian Medical College
	BS	5	2	Huazhong University of Science and Technique; Tianjing TCM University
	BM	5	3	Guilin Medical College; Nanchang University; Taishan Medical College
	BM	4	1	Bengbu Medical College
Total			30	

The length of program varied in different colleges. Of the 17 colleges with formal clinical programs, 16 provided 5-year programs while 1 provided a 4-year program. Of the 9 colleges with a clinical pharmacy concentration as part of a pharmacy program, 7 provided 4-year programs and 2 provided 5-year programs. Of the 4 colleges with a clinical pharmacy concentration as part of medicine programs, 3 provided 5-year programs and 1, a 4-year program. In total, 21 colleges provided 5-year programs and 9 provided 4-year programs.

According to incomplete statistics issued by the Chinese Pharmacy Almanac, in 2006 there were 115 students studying clinical pharmacy programs,<sup>11</sup> and this number had risen to 377 by 2009.<sup>12</sup> As the number of colleges providing clinical pharmacy programs increased, the number of students tripled. Based on the admission plans of 30 colleges, roughly 610 students were enrolled in clinical pharmacy programs in 2012.

There were no accreditation standards or guidelines for pharmacy programs in China. Each college established its own clinical pharmacy program, based on the other pharmacy programs in the college. PharmD programs in pharmacy colleges in the United States were used as references during the establishment of clinical pharmacy programs in many colleges. However, compared with PharmD programs in the United States, the curriculum structure of clinical pharmacy programs in China remained more traditional, in which subjects were set separately as different courses at different levels for each academic year, rather than as courses that run throughout academic years from low level to high level. Although some colleges did reform their programs when setting the new clinical pharmacy program, trying to change the curriculum structure to the progressive integrated course model can be difficult when the rest of the education system works in the traditional way.

The curriculum is different in each college, but generally there are 5 core elements: general education courses, including humanities and social sciences, expression and comprehension courses; foundation specialty courses, including biomedical and chemistry courses; professional and service courses, including pharmaceutical and clinical science; research and individual development courses, including pharmacy research seminars, innovative courses, and experiments; and some element of practical experience, including medical practice and pharmacy medical practice. All clinical pharmacy programs offer at least 1 year of practice. Compared with traditional pharmacy programs, the clinical pharmacy programs put more emphasis on clinical science courses and practical training, and less on chemistry and experimentation. They also put more

emphasis on the development of empathy and service conscientiousness.

### **Graduate Degrees**

Until 2012, there were 4 kinds of clinical pharmacy master's degree programs: an MS in clinical pharmacy, an MPharm with a clinical pharmacy concentration, an MS in clinical medicine or pharmacology with a clinical pharmacy concentration, and a long-term program (7-8 years as opposed to 4-5 years) of clinical pharmacy. In total, 44 colleges in 30 universities recruited clinical pharmacy graduate students (Table 2). Statistics from these colleges show that about 92 students were enrolled in these programs in 2012.

Early in 1982, the Department of Clinical Pharmacy in the Huashan Hospital at Fudan University recruited graduate students in clinical pharmacy.<sup>5</sup> After that, other colleges gradually introduced clinical pharmacy courses within their MS programs in clinical medicine or pharmacology. By 2012, 29 colleges in 19 universities had recruited graduate students for clinical pharmacy courses under the umbrella of MS programs in pharmaceuticals, pharmacology, and pharmaceutical analysis. Graduate students were awarded an MS from the relevant pharmacy program, but not one in clinical pharmacy.

In 2001, Peking University established a 6-year, long-term pharmacy program,<sup>13</sup> which allowed students to obtain their BSc Pharmacy degree after 4 years or enroll in different graduate pharmacy programs leading to an MS degree after passing a graduate-level English examination at the end of the third year. Those graduate programs included pharmaceutical chemistry, pharmaceuticals, pharmacognosy, pharmaceutical analysis, chemical biology, pharmacology, and clinical pharmacy. That was the first graduate program to offer a formal MS degree in clinical pharmacy. In 2005, Shandong University established a similar long-term pharmacy program, a 7-year clinical pharmacy concentration under the master's program in medicine.<sup>14</sup> Generally in China, MS and PhD programs must be approved by the MOE. In 2002, the MOE reformed its graduate degree-setting system, so that any university with authorization to deliver first-tier doctorate disciplines, such as pharmacy, could also establish master's or doctorate degrees in second-tier disciplines such as clinical pharmacy and pharmacy administration, without separate consent from the MOE.<sup>15</sup> As a rapid response to this reform, Peking University and the Chinese Pharmaceutical University both set up clinical pharmacy MS programs. Since then more colleges with well-organized resources and good reputations in pharmacy have been approved to set up similar programs. By 2006, 9 colleges in 6 universities had established clinical

Table 2. Clinical Pharmacy Graduate Programs in China

Program	Degree	Academic years	Number of universities	Number of colleges or institutions	College List
Clinical pharmacy MS program	MS	3	6	9	College of Pharmacy, Chinese Pharmaceutical University; College of Pharmacy, 1 <sup>st</sup> hospital, 3 <sup>rd</sup> hospital, Peking University; Changhai hospital, Fuzhou general hospital of Nanjing Military command, the 2 <sup>nd</sup> Military Medical University; College of Pharmacy, Shandong University; College of Life Science and Biopharmaceutical, Shenyang Pharmaceutical University; College of Pharmacy, Sichuan University
Clinical pharmacy concentration under other MS program	MS	3	19	29	Chinese Medical University; Chongqing Medical University; Guangdong Medical College; Guangxi Medical University; Guangzhou TCM University; Guiyang Medical College; Harbin Medical University; Huazhong University of Science and Technique; Liaoning Medical College; Luzhou Medical College; The Inner Mongol Medical University; Nanjing Medical University; Nantong University; Shanxi Medical University; Wenzhou Medical College; Wuhan University; Xian Jiaotong University; Xuzhou Midical College; Yanbian University; Yangzhou University;
Clinical pharmacy concentration under MPharm	MPharm	3	11	11	College of Pharmacy: Anhui Medical University; Chinese Pharmaceutical University; Chongqing Medical University; Fujian Medical University; Fudan University; Peking University; Shandong TCM University; Shanxi Medical University; Shenyang Pharmaceutical University; Sichuan University; 4 <sup>th</sup> hospital, Harbin Medical University
Long-term clinical pharmacy program	BS,-MS, MD	6 7	1 1	1 1	College of Pharmacy, Peking University College of Pharmacy, Shandong University
Total <sup>a</sup>			30	44	

<sup>a</sup> Note: excludes duplicated colleges and universities.

pharmacy MS and PhD programs, and this continued to increase until 2012.<sup>16</sup>

In 2010, the MOE conducted another reform by issuing 19 new professional master's degree program schemes.<sup>17</sup> These were intended to focus on high-level applied and professional skills rather than academic or research skills. A professional master of pharmacy (MPharm) was one of these degree programs. As a result of this reform, 38 universities and institutions were approved to establish MPharm programs in 2011,<sup>18</sup>

and 11 established clinical pharmacy courses under the new program.

Although the above programs included a research thesis as one of their graduation requirements, content varied among programs and colleges depending on their different understanding of clinical pharmacy and course intention. Generally, a clinical pharmacy concentration under a pharmacy MS program focused on clinical research, including pharmacokinetics, pharmacogenetics, pharmacogenomics, and new drug development. A clinical

pharmacy concentration within an MPharm program emphasized practice, providing each student with a supervisor from the college and a preceptor from a hospital and requiring at least 6 months of practical training. The MS programs in clinical pharmacy varied depending on where supervisors were based, whether the setting was a college, hospital or institute, and where the programs were located in a college or hospital. Some of them focused on academic research and others on practical training. The long-term clinical pharmacy programs at Peking and Shandong Universities placed more emphasis on clinical practice and required a long period of residency in hospitals.

As of 2012, there was no professional doctoral degree of pharmacy (PharmD) in China. As with master's degree programs, after 2000, clinical pharmacy at the doctoral level was usually provided as a concentration under other pharmacy PhD programs, such as pharmaceuticals or pharmacology. By 2012, more than 10 universities were recruiting students for this kind of course. In 2003, Sichuan University and Shenyang Pharmaceutical University established the first formal clinical pharmacy PhD program, and between then and 2012, another 6 universities established their own, with approximately 7–8 students enrolled every year.

## **Postgraduate Education**

### **Hospital Pharmacist Standardized Training Program**

In 1999, the MOH issued an outline of the Hospital Pharmacist Standardized Training Program as a part of the standardized resident training system for clinical professionals.<sup>19</sup> The outline recommended that all new hospital pharmacists should attend a 2-phase standardized training program when they graduate from college. The first phase was a 3-year general residency, in which the new pharmacist would rotate through all sub-departments of the hospital pharmacy department, including outpatients (4–5 months), inpatients (5–6 months), drug storage (3 months), preparation (5–6 months), drug inspection and control (4–6 months), clinical pharmacy (6–8 months), clinical pharmacology (2–4 months), and drug information (2 months). The outline also recommended that pharmacists attend lectures and seminars during this time to learn about drug management, prescription review, formula preparation, drug quality inspection and control, therapeutic drug monitoring, adverse drug reaction reports, drug information consulting, research skills including biostatistics, medical research design, literature searches, and pharmacy policies and regulation. The second phase was a 2-year specific residency, during which the pharmacist would focus on one department of clinical pharmacy: dispensing, preparation, or research.

The standardized training program was not a requirement for every hospital pharmacist, so the MOH did not take measures to promote it. It was therefore not implemented very well or consistently. Until 2012, only the Peking region had put in place the detailed components necessary to implement the program. In 2006, 14 hospitals in Peking were authorized as training bases. The first batch of residents, a total of 58 pharmacists, finished their first-phase standardized training program in 2009 and entered second-phase training in hospitals.<sup>20</sup>

### **One-Year Clinical Pharmacist Training Program**

In order to train more pharmacists for clinical service, the MOH set up the Clinical Pharmacist Training Pilot Program in 2005, with the assistance of the Pharmacy Administration Committee of the Chinese Hospital Association and pharmacy colleges. The Pilot Work Programme issued by the MOH in 2005<sup>21</sup> recommended that selected pharmacists should come from Grade II or above hospitals and be enrolled in authorized training hospitals to take a 1-year residency program. The grade of a hospital is determined by number of beds, service scales, and location by MOH. A first grade hospital (primary hospital) usually has 20–99 beds and provides basic medical services for a community or a town. A second grade hospital (secondary hospital) usually has 100–499 beds and services a county, and a third grade hospital (tertiary hospital) usually has more than 500 beds and services a whole city or region. In this program, resident pharmacists would work and study for at least 49 weeks, including 1765 hours of clinical practice experience in a particular specialty, and 195 hours of lectures or seminars.

There were 12 possible specialties provided by training hospitals, including anti-infection, cardiovascular, respiratory, intensive care unit, anti-tumor, endocrine, organ transplant, neurology, nephrology, respiratory, gastroenterology and external nutrition. Each training hospital could provide training in 1 to 3 specialties. During the practice experience, the hospital provided a coordinator team for every 2 resident pharmacists, consisting of at least 1 clinical doctor preceptor and 1 clinical pharmacist preceptor. The process involved extensive assessment, covering processing, theory, clinical records, and cases. After passing the final assessment with the Clinical Pharmacist Training Steering Committee, the resident pharmacists would earn a certification in clinical pharmacy and then return to their own hospitals to work as clinical pharmacists.

With the pilot period spanning 2006 to 2008, the MOH announced the first group of 19 pilot training hospitals in November 2005, the second group of 31 in December 2006, and issued training guidelines for 10 specialties. Four

hundred fifteen clinical pharmacists from 241 hospitals around the country obtained a clinical pharmacist certification during these 3 years.<sup>22</sup> Because the pilot was successful, the MOH decided to increase the scale of the training program, approving a third group of 43 hospitals in 2010 and a fourth group of 18 in 2012. Eleven preceptor training hospitals were selected from these clinical pharmacist training hospitals to train pharmacist preceptors.<sup>23</sup> By the end of 2012, there were 111 training hospitals and 202 preceptor pharmacists, and 1332 clinical pharmacists from over 500 hospitals had been trained in this 1-year residency program. By 2013, about 110 preceptors and 1200 clinical pharmacists could be trained every year.<sup>24</sup>

**Two-year Clinical Pharmacist Residency Program**

In 2006, with the support of the MOH, the West China Hospital and West China College of Pharmacy at Sichuan University innovatively established a “4+2” clinical pharmacist residency program.<sup>25</sup> The program recruited graduates who had taken pharmacy or clinical pharmacy courses for at least 4 years into a 2-year clinical pharmacist residency program. In the first year, residents attended a practice experience in different clinical departments and studied pharmaceutical and medical subjects. In the second year, they attended a specific enforced practice experience and undertook research. At the end of the program, they were certified by the MOH as a clinical

pharmacist and as an advanced pharmacist by the West China Hospital.

Every year, this program recruited 4 to 10 residents from around the country through examination and interview. By 2012, 59 residents had enrolled in the program and 43 had obtained their certifications (one from the 1-year program through the MOH and the other from the advanced pharmacist certification through West China Hospital) and entered hospitals as advanced clinical pharmacists.

Table 3 shows the main characteristics of the 3 post-graduate pharmacy programs.

**DISCUSSION**

**Current Status of Clinical Pharmacy Education in China and Barriers It Faces**

A growing clinical pharmacy education system has been established in China over the past 2 decades, which includes undergraduate and graduate programs at colleges and postgraduate training programs at hospitals. Compared with other Asian countries, the developing pace of clinical pharmacy education in China is slow. Early in 1999, the first 6-year PharmD program was offered in Thailand,<sup>26</sup> a 6-year pharmacy education system was established under the Pharmacists Law and the Fundamentals of Education Act in Japan in 2006,<sup>27</sup> India introduced a PharmD program in 2008, and Nepal started a postbachelor PharmD program in 2010.<sup>28,29</sup> Vietnam reformed its BPharm curriculum,

Table 3. The 3 Main PostGraduate Pharmacist Training Programs in China

Items	Peking Hospital Pharmacist Standardized Training Program	1-Year Clinical Pharmacist Training Program	2-Year Clinical Pharmacist Residency Program
Sponsor	Peking Department of Health	MOH	MOH
Provider	14 hospital training bases in Peking	111 training hospitals all over the country	West China Hospital, West China College, SCU
Recruit scale every year	Depends	About 430	10
Training objectives	New pharmacists in hospitals in Peking area	Selected pharmacists in Grade II or above hospitals in China	Selected graduates with at least bachelor degree of pharmacy or clinical pharmacy in China
Training objective	Hospital pharmacist	Clinical pharmacist	Clinical pharmacist
Training length	Phase 1: 3 years Phase 2: 2 years	1 year	2 years
Main training content	Phase 1: general rotations in pharmacy departments Phase 2: specific rotation in a certain pharmacy department	Clinical rotation in one of 13 clinical specific department	First year: General rotations in clinical departments Second year: specific rotation in a certain clinical department
Certification	Training certification by Peking Department of Health	Clinical pharmacist Certification by MOH	Clinical pharmacist Certification by MOH
Employment	Come back to employer hospital	Come back to employer hospital	Seek pharmacist position by themselves

requiring pharmacy schools to increase the clinical elements and offer a specialization in clinical pharmacy.<sup>30</sup> In the short term, it will be difficult to establish a 6-year PharmD program in China because of the restrictions of the current educational system. Because of the rapid development of the Chinese pharmaceutical industry, mainstream pharmacy education is likely to focus on providing research, manufacturing, and marketing skills in the immediate future. Moreover, it will be difficult to change pharmacy education from chemistry- to patient-centered. Although the number of colleges with a clinical pharmacy program is still small compared with mainstream pharmacy, it is rapidly increasing, as more colleges become aware of the growing need for clinical pharmacists. A positive aspect of the development of clinical pharmacy education in China is that, with the support of the MOH, the clinical pharmacist training programs are filling the gap in the knowledge and skills of existing pharmacists and are becoming an important way to meet the immediate need for clinical pharmacists.

The main barriers facing clinical pharmacy education in China exist in the undergraduate educational system. First, the curriculum structure and content in clinical pharmacy programs needs to be improved to make it more practical and systematic. Although the current curriculum in the 5-year clinical pharmacy program is an improvement on the previous 4-year pharmacy program, the inherent defects in the traditional Chinese curriculum structure are still apparent. For example, courses are too elaborate and lack coherence and integrity from course to course and do not truly help students obtain practical clinical skills.<sup>31</sup> Second, the practical elements of clinical pharmacy programs need to be adjusted to make them fit for purpose. In most clinical pharmacy programs in China, the practical element is separate, in a “4+1” model: 4 years of theory plus 1 year of practice. Students lack sufficient opportunity to consolidate their theoretical knowledge in the earlier stages and find it difficult to adjust when they enter practice. There are still no well-designed assessment criteria for clinical pharmacy practice and little effective supervision when students are practicing in hospitals or other institutions. As a result, the practical element is probably only half as effective as it could be, but requires twice the effort.<sup>32</sup> Third, the curricular development efforts need input from hospitals. In China there is little or no close cooperation between pharmacy colleges and hospitals, and most faculty members of pharmacy colleges lack any clinical experience or background.

### **Opportunities and Future Direction for Clinical Pharmacy Education**

The MOH requires the number of clinical pharmacists to be no less than 3 in Grade III hospitals, and no less

than 2 in Grade II hospitals.<sup>3</sup> This would mean supplying both types of hospitals with at least 26,000 more clinical pharmacists. However, the more urgent need for pharmacy graduates is appropriate knowledge and skills in patient care. The demand for clinically trained pharmacists is therefore urgent. To promote the development of clinical pharmacy education, some measures are being or will be taken by the government, professional associations, and colleges. For example, the establishment of clinical pharmacy programs is being encouraged. The MOE has relaxed the requirements for new undergraduate and graduate programs, and for many pharmacy colleges, this is a good opportunity to establish programs that better suit their students. Another example is the establishment of accreditation standards and guidelines for clinical pharmacy programs. The Pharmacy Administration Committee of the Chinese Hospital Association and several major pharmacy colleges in China have discussed setting up standards for clinical pharmacy programs and directions for implementing them. More guidelines are expected to emerge in future. Enhancing the coherence and integrity of courses in clinical pharmacy programs through continual curriculum reform and piloting by colleges is also a step forward. For example, the latest curriculum for the clinical pharmacy undergraduate program at West China School of Pharmacy at Sichuan University created a series of pharmacy and pharmaceutical practical requirements for the fourth semester and moved forward some professional courses, such as Drug Information, Pharmacy Communication, and Pharmacy Administration. Finally, cooperation between pharmacy colleges and hospitals must be strengthened, more faculty members with a clinical pharmacy background must be recruited, and hospital pharmacists must be involved in teaching college courses. For example, Peking University incorporated more than 10 affiliated or teaching hospitals as bases for clinical pharmacy students to undertake clinical practice and employed the senior pharmacists in these hospitals as supervisors for MS and PhD students in clinical pharmacy.

### **CONCLUSION**

Although it might never become part of mainstream of pharmacy education in China, clinical pharmacy education has developed rapidly in the past decade and has become an important part of the Chinese pharmacy education system. It now includes undergraduate, graduate, and postgraduate programs. Despite some barriers to its development, the future for clinical pharmacy education looks bright.

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