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Assessing training needs of primary care pharmacists: a cross-sectional survey in China

Qingran Sun¹, Yanan You¹, Kejia Cao¹, Yuankai Huang^{1*} and Xiaoyu Xi^{1*}

Abstract

Background Training can significantly improve the knowledge and skills of pharmacists. Previous study showed that there is a large gap in the training of pharmacists across countries. Primary healthcare workers did not have enough opportunities to trainings in China. This study aimed to explore the current status of training content, training approaches and unmet training needs from the perspective of primary care pharmacists.

Method A multi-stage sampling method was used to conduct a questionnaire survey to collect the basic characteristics of primary medical institutions and pharmacists, the current status of primary care pharmacists' training content and training approaches, and the unmet training needs. Descriptive statistics was used to report characteristics of the sample and paired chi-square test was used to test whether the training contents and training approaches meeting the needs of primary care pharmacists.

Results Most of primary care pharmacists enter the field of pharmacy by receiving pharmaceutical education in colleges and universities, and have obtained professional title qualification and licensed pharmacist qualification certificate. The annual income and proportion of the pharmacists of bachelor degree or above in eastern and western parts are higher than the central region, and the difference was statistically significant. About 67.9% of the surveyed pharmacists received training less than once a year. There was statistically difference between current and expected training content and approach of primary pharmacists, showing that the group is still obviously has unmet training demands. The training contents of "clinical pharmacy knowledge, ability to deal with and analyze problems, and skills to provide pharmaceutical services" and the training mode of "further education in school" are the direction of development of the future training of primary care pharmacists.

Conclusion The education and training of primary care pharmaceutical professionals in China have achieved initial success. This study identified the basic parts and future direction of development of training content and training form for primary care pharmaceutical professionals. The results of this study can be used as a basis for further development and research into the requirements of on-the-job training and continuing education for pharmacists.

Keywords Training needs, Continuing education, Pharmacist, Primary healthcare, China

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Introduction

Primary healthcare is the cornerstone of China's three-tier healthcare system. Hierarchical medical system, medical alliances, and the coronavirus disease 2019 (COVID-19) pandemic have enhanced the role of primary healthcare [1], which has put forward higher requirements for the number and capacity of the health workforce in primary medical institutions. Pharmacists are basic component of the healthcare team, which can reduce the risk of potential adverse drug events, improve patients' health outcomes and reduce medical expenses [2, 3].

The pharmacists will affect the level and quality of pharmaceutical care in primary health institutions. As the update of clinical knowledge, and the change of professional environment, pharmacists need to constantly improve their professional skills and knowledge [4]. Continuing Education (CE) and Continuing Professional Development (CPD) is necessary to develop and update healthcare professionals' professional skills, and CE is a major component of CPD. Accreditation Council for Pharmacy Education (ACPE) defines CPD as a self-directed, ongoing, systematic and outcomes-focused approach to lifelong learning that is applied into practice [5]. ACPE defines CE as a structured educational activity designed or intended to support the continuing development of pharmacists to maintain and enhance their competence [6]. Training is a major form of CE, studies showed that training can significantly improve the knowledge, information, attitudes and skills of pharmacists, so that pharmacists can remain updated and competent [7]. Many countries have been trying to explore pharmacist training programs [8]. A study conducted by International Pharmaceutical Federation (FIP) in 2014 showed that there is still a large gap in the training of pharmacists across countries. In the Netherlands, Norway, Sweden, Finland, Indonesia and other countries, the duration of practical training before the registration of pharmacists varies, ranging from 6 months to 1 year. After registration, half surveyed countries/regions (33/62) require pharmacists to maintain registration through on-the-job training or other forms [9–12]. The training of pharmacists in China is also developing through continuous exploration. In 2005, the former Ministry of Health launched the work of "clinical pharmacist training pilot" [13]. By 2022, a total of 284 clinical pharmacist training bases had been established in China [14]. Ministry of Human Resources and Social Security of the People's Republic of China (MOHRSS) requires that professional and technical personnel should participate in continuing education. The content of continuing education includes general and professional subjects. The forms of continuing education that meet the requirements include training classes, study classes, practical activities, remote

education, academic conferences, academic lectures, academic visits or other ways that meet the regulations [15]. In terms of primary health personnel training, the National Health Commission selected 96 bases for the capacity improvement training project of primary health personnel in 2023[16], and bound the continuing education credits and advanced study requirements to the senior title application qualifications of primary health personnel [17].

It can be seen that continuing education and training of primary pharmacists have been paid more attention for a long time. However, there is a mismatch between knowledge obtained from higher pharmacy education institutions and the tasks of a primary care pharmacist [18–21]. Previous surveys have shown that due to lack of knowledge and skills, many primary care pharmacists are unable to respond to health care work in a timely and effective manner [22–24]. Although the health authorities have provided many training opportunities for primary healthcare workers since 2009, they actually do not have access to the trainings. Moreover, the training design does not meet the actual needs of them, and the training has not improved their capacity [25]. Therefore, it is necessary to understand the current training status of primary care pharmacists and whether the current situation meets their actual needs, so as to provide evidence for the development of on-the-job training and continuing education programs for pharmacists.

At present, more evidence is needed on the training status and needs of primary care pharmacists. There are two problems in the studies on the training of Chinese pharmacists: First, the time limit of the study cannot reflect the changing needs of primary care pharmacists in the post-COVID-19 era. The second is the sample representativeness. Mostly research focus on some provinces or cities, which is related to the regional economic development, medical level, the education ability and preference. The sample is not nationally representative [26–30].

Therefore, the current training status of pharmacists and the gap of training needs in primary medical institutions are not clear. In order to ensure the training plan to meet the demand of pharmacists, this study conducts a nationwide survey to further explore the training status of basic skills of primary care pharmacists and its unmet training needs on the basis of existing research. This study aims to explore issues about training of China's primary care pharmacist team from the perspective of pharmacist needs so as to put forward policy recommendations for the further development of China's primary pharmaceutical industry, and provide reference for the construction of pharmacists in primary health institutions in China.

Materials and methods

Participants

The subjects of this study were pharmacists in primary medical and health institutions. Inclusion criteria were as follows: the respondent (1) was at least 18 years of age; (2) was dispensing pharmacist, clinical pharmacist or pharmacy technician; (3) have worked in primary medical and health institutions for at least 1 year; (4) have the ability and willingness to participate in completed questionnaires about 30 min long. Each eligible respondent was provided with informed consent.

Data source

Data were collected by a descriptive, cross-sectional study of the nationwide pharmacist workforce at primary healthcare institutions in 2021. The total number of pharmacists registered in primary healthcare institutions was 167,647[31]. Raosoft(<http://www.raosoft.com/samplesize.html>) was used to calculate the target sample size; with a margin of error of 5% and a confidence interval of 95%, a minimum sample of 384 pharmacists was considered an acceptable sample size.

For extended sample coverage reflecting the overall working status of pharmacists in China, this study adopts a multi-stage sampling strategy to extract samples. The steps are as follows: (1) a total of 31 provinces (autonomous regions)/municipalities in mainland China were included, and in each province (autonomous region)/municipality, all cities were divided into three urban groups according to their GDP per capita in 2020, with a total of 93 urban groups included; (2) based on the primary healthcare institutions administrators' willingness, convenience sampling was adopted to select specific institutions, and at least 4 primary healthcare institutions were selected in each urban group; and (3) in each institution, at least 1 pharmacists were selected according to whether they agreed to participate and met the following criteria.

Instruments

This study developed a questionnaire based on the national continuing medical education regulations [32], combined with the existing literature research [26–30], the “continuing education Regulations for Professional and Technical personnel” and the relevant regulations of the primary health personnel ability improvement training projects of National Health Commission and provincial health commissions [15, 33, 34]. The questionnaire was validated according to following phases: First, the questionnaire was sent for expert review to three pharmacists in a primary hospital to valid face and content validity. Subsequently, a pilot test was conducted in Nanjing, Jiangsu Province by convenience sampling. A total of 16 pharmacists were involved in pilot study and data

were not included in the results. The questionnaire was improved based on the findings of the expert review and pilot study. The final questionnaire was shown in Additional file 2.

The final questionnaire consisted of two parts:

The first part of the questionnaire consisted of 14 questions, which collected the information of the surveyed institutions and the basic information of the surveyed pharmacists, respectively. Institution information including: ① the province or city where the respondent is located, in order to divide regions according to China's consistent geographical divisions. ② Type of institution. There are many types of primary healthcare institutions in China, including township health centers, community health service centers, community health service stations, and village clinics. Different types of institutions have different scales and responsibilities. The basic information of pharmacists included: ① demographic information, including gender, age, marital status, education background. ② work related information, including work qualification, route to enter the field of pharmacy, form of employment, professional title, annual income, weekly working hours, and whether to work night shifts, which helps us to understand the composition of the primary pharmacist team and their current working status.

The second part was the survey of pharmacists' training, which set up five dimensions. ① The number of training times received by the surveyed pharmacists in the past 3 years, ② the content of training they actually received (multiple choice questions, total 12 options), ③ the content of training they expected to receive (multiple choice questions, total 12 options same as ②), ④ the way they actually received training (multiple choice questions, total 9 options), ⑤ the way they expected to receive training (multiple choice questions, total 9 options same as ④). These questions are set to reflect the current training status and needs of the respondents.

Data collection

In this study, a total of 93 undergraduate students with pharmacy education background were recruited as data collectors and trained. The training content included the description of content, the form and process, and the etiquette.

Data collectors conducted the survey from July to September in 2021. After obtaining the consent of the managers of the primary healthcare institutions, the data collectors used the free time of the potential respondent to ask basic information of them to determine whether they met the inclusion criteria for the study. Then, the respondents who met the criteria were explained the purpose, content, and requirements of the survey, and asked whether they were willing to participate. After obtaining the signed consent form from the respondents, the data

collectors worked with the respondents to determine the specific time and place to conduct the survey.

The respondents completed the online survey questionnaire and submitted it. During the survey, data collectors were not allowed to provide any opinions on the questionnaire, but only requests or instruction. All of the research data were collected by team-designed software and were processed into identifiable electronic data. In order to ensure the quality of the survey data, the survey system used in this study can set the format of question response, so as to ensure that the data meet the requirements.

Statistical analysis

Descriptive statistics were used to report the characteristics of the sample. The paired χ^2 test was used to test whether the training content and way met the needs of primary care pharmacists. The chi-square test was used to test whether the differences of expected training content and training way of subgroups (type of institution, region, age, annual income, gender, marital status, professional title, education background, weekly working hours, night shift, employment form, qualification certificate, entry route, number of training in three years) were significant (Additional file 1). Results were significant when *P* values were less than 0.05. All analyses are conducted using Stata 15.0.

Results

Characteristics of sample

A total of 1206 questionnaires were collected from 783 primary healthcare institutions in 31 provinces. After data cleaning, 638 pharmacists' questionnaires were reserved (valid response rate was 53%). Among the excluded questionnaires, several reasons of exclusion were as follows: (1) the institution where the respondent belongs to is not a primary healthcare institution; (2) the answers of questions were inconsistent and did not pass the logic test; (3) the questionnaire was incomplete or the datafile of which was damaged and unable to be fixed or rebuilt by return visits.

The distribution results of primary health institutions in this survey are shown in Table 1. Among the surveyed institutions in this study, the number of township health centers in the eastern region (60) was slightly lower than that in the central (67) and western regions (67), but the number of community health service centers (113) was much higher than that in the central (47) and western regions (65). The number of village clinics in the eastern and central regions was roughly equal (36:37), while it was slightly lower in the western region (21). According to the China Health Statistics Yearbook, the geographical distribution and the types of institutions surveyed in this study are consistent with external data [35].

Characteristics of surveyed pharmacists

As shown in Table 2, the pharmaceutical professionals in the sample institutions are mainly female (65%), with the age mainly concentrated between 18 and 49 years old (90%). Pharmaceutical technical personnel over 50 years old account for a relatively small proportion (10%), and the basic characteristics of the respondents are basically consistent with external data [35].

In terms of the employment form of pharmaceutical professionals, about half (55%) of the respondents have an officially budgeted post. In terms of the educational background, bachelor's degree (53%) and junior college (30%) account for the highest proportion. From the perspective of professional titles, junior titles (56%) account for the highest proportion. About 72% of the pharmacists entered the field through professional pharmacy education in college, while other ways including the non-pharmacy personnel transferred to pharmacy (8%), arranged to be in charge of drug administration (7%), and non-pharmaceutical personnel pursue further studies in pharmacy in colleges and universities (6%) were few and scattered. The proportion of pharmacists who have received 2–3 times of trainings in the past three years is the highest (46%).

There were significant differences in the distribution of age group, marital status, route to entering the pharmacy field, highest education level, annual income, weekly working hours, and number of trainings received

Table 1 Distribution characteristics of primary medical and health institutions

Institution type/ geographical distribution	Eastern N(%)	Central N(%)	Western N(%)	Total N(%)
Township health centers	60(9.40)	67(0.10)	67(0.10)	194(0.30)
Community health service centers	113(0.17)	47(0.07)	65(0.10)	225(0.35)
Community health service stations	40(0.06)	23(0.03)	47(0.07)	110(0.17)
Village clinics	36(0.05)	37(0.05)	21(0.03)	94(0.14)
Other	4(0.00)	1(< 0.01)	10(0.01)	15(0.02)
Total	253(0.39)	175(0.27)	210(0.32)	638(1.00)

Table 2 Basic characteristics of primary pharmacists

Item	Total N(%)	Eastern N(%)	Central N(%)	Western N(%)	P-value
Gender					
Male	222(0.35)	79(0.31)	73(0.42)	70(0.33)	0.070
Female	416(0.65)	174(0.69)	102(0.58)	140(0.67)	
Age					
18–35	286(0.45)	125(0.49)	62(0.35)	99(0.47)	0.045*
36–49	286(0.45)	101(0.40)	92(0.53)	93(0.44)	
No less than 50	66(0.10)	27(0.11)	21(0.12)	18(0.09)	
Marital status					
Unmarried	111(0.17)	194(0.77)	159(0.91)	162(0.77)	0.001**
Married	515(0.81)	56(0.22)	13(0.07)	42(0.20)	
Other	12(0.02)	3(0.01)	3(0.02)	6(0.03)	
Employment form					
Staffing	353(0.55)	130(0.51)	109(0.62)	114(0.54)	0.273
Non-staff	268(0.42)	116(0.46)	62(0.35)	90(0.43)	
Intern/temporary worker	17(0.03)	7(0.03)	4(0.02)	6(0.03)	
Qualifications ^a					
Licensed pharmacist qualification certificate	448(0.70)	178(0.70)	119(0.68)	151(0.72)	0.705
Professional title pharmacist qualification certificate	521(0.82)	212(0.84)	133(0.76)	176(0.84)	0.076
The qualification certificate of pharmacist	493(0.77)	196(0.77)	136(0.78)	161(0.77)	0.966
Clinical pharmacist (post training) certificate	277(0.43)	113(0.45)	75(0.43)	89(0.42)	0.872
None of the above	66(0.10)	23(0.09)	25(0.14)	18(0.09)	0.131
Highest degree					
Technical secondary school or below	73(0.11)	21(0.08)	35(0.20)	17(0.08)	0.004**
Junior college	194(0.30)	78(0.31)	50(0.29)	66(0.31)	
Bachelor	338(0.53)	137(0.54)	86(0.49)	115(0.55)	
Master	31(0.05)	16(0.06)	3(0.02)	12(0.06)	
PhD	2(< 0.01)	1(< 0.01)	1(0.01)	0(0.00)	
Professional title					
None (including pending employment)	117(0.18)	41(0.16)	42(0.24)	34(0.16)	0.614
junior	355(0.56)	143(0.57)	91(0.52)	121(0.58)	
intermediate	123(0.19)	49(0.19)	32(0.18)	42(0.20)	
deputy senior	38(0.06)	17(0.07)	9(0.05)	12(0.06)	
senior	5(0.01)	3(0.01)	1(0.01)	1(< 0.01)	
Route to entering the pharmacy field					
Graduated from a pharmacy school	460(0.72)	187(0.74)	121(0.69)	152(0.72)	0.020*
Non-pharmacy personnel transferred to pharmacy	52(0.08)	15(0.06)	14(0.08)	11(0.05)	
Non-pharmaceutical personnel's further studies in pharmacy in colleges	40(0.06)	12(0.05)	2(0.01)	8(0.04)	
Arranged to be in charge of drug administration	42(0.07)	11(0.04)	9(0.05)	2(0.01)	
Pharmaceutical apprentice	22(0.03)	19(0.08)	18(0.10)	15(0.07)	
Pharmacy correspondence education	22(0.03)	9(0.04)	11(0.06)	22(0.10)	
Annual income					
Less than 30,000	33(0.05)	17(0.07)	30(0.17)	25(0.12)	< 0.001***
30,000–80,000 yuan	376(0.59)	135(0.53)	117(0.67)	132(0.63)	
80,000–150,000 yuan	180(0.28)	82(0.32)	22(0.13)	43(0.20)	
More than 150000 yuan	49(0.08)	19(0.08)	6(0.03)	10(0.05)	
Weekly working hours					
≤ 35 h	287(0.45)	44(0.17)	23(0.13)	25(0.12)	0.001**
>35 and ≤ 40 h	259(0.41)	127(0.50)	61(0.35)	99(0.47)	
>40 h	92(0.14)	82(0.32)	91(0.52)	86(0.41)	
Night shift					
Yes	252(0.39)	163(0.64)	97(0.55)	126(0.60)	0.171
No	386(0.61)	90(0.36)	78(0.45)	84(0.40)	

Table 2 (continued)

Item	Total N(%)	Eastern N(%)	Central N(%)	Western N(%)	P-value
Number of trainings received in the past three years					
≤ 1	141(0.22)	49(0.19)	50(0.29)	42(0.20)	0.004**
2–3 times	292(0.46)	117(0.46)	75(0.43)	100(0.48)	
4–5 times	109(0.17)	35(0.14)	36(0.21)	38(0.18)	
≥ 6 times	96(0.15)	52(0.21)	14(0.08)	30(0.14)	

a. This is a multiple-choice question

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Survey of training content for primary care pharmacists

Questionnaire Composition	Current Training Content N(%)	Expected Training Content N(%)	P (Paired χ^2 Test)
Drug policies, systems and regulations	406(63.64)	358(56.11)	0.001**
Basic theoretical knowledge of pharmacy	370(57.99)	367(57.52)	0.888
Clinical manifestations and diagnosis and treatment standards of common diseases	359(56.27)	437(68.50)	< 0.001***
Information and rational use of common clinical drugs	386(60.50)	440(68.97)	< 0.001***
Safety issues of drug treatment	415(65.05)	392(61.44)	0.13
Drug storage knowledge and drug management	369(57.84)	370(57.99)	1.000
Clinical pharmacy knowledge	252(39.50)	368(57.68)	< 0.001***
Professional ethics of pharmaceutical personnel	271(42.48)	229(35.89)	0.002**
Ability to handle and analyze problems	156(24.45)	300(47.02)	< 0.001***
Skills to provide pharmaceutical services	165(25.86)	289(45.30)	< 0.001***
Retrieval techniques for pharmaceutical literature at home and abroad	50(7.84)	16(2.51)	< 0.001***
Other	25(3.92)	9(1.41)	< 0.001***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in the past three years among the respondents in different regions (eastern, central, and western regions). In the central region, respondents of “36–49 age, unmarried, and technical secondary school educational background or below, annual income less than 30000-yuan, weekly working hours more than 40 hours, the number of trainings received in recent 3 years no more than 1 ” were more than eastern and western regions.

Training content and training approaches for primary care pharmacists

As shown in Table 3, among the current training content, safety issues of drug treatment (65.05%), drug policies, systems and regulations (63.64%), information and rational use of common clinical drugs (60.50%) had the highest frequency. The most expected training contents of primary care pharmacists were the information and rational use of common clinical drugs (68.97%), the clinical manifestations and diagnosis and treatment standards of common diseases (68.50%), and safety issues of drug treatment (61.44%). Except for the basic theoretical knowledge of pharmacy, safety issues of drug treatment, drug storage knowledge and drug management, there were statistically significant differences between the current and the expected training content of pharmacists in primary medical institutions, indicating that the

current training content does not fully meet the needs of pharmacists.

As shown in Table 4, primary care pharmacists mainly participated in training by participating in meetings or special lectures (58.31%), internal training (43.10%), and short-term study in superior hospitals (38.87%). However, they were most likely to be trained by short-term study in superior hospitals (60.34%), participating in meetings/special lectures (48.59%), and on-site guidance from superior hospitals (47.65%). In addition to the remote education, there were statistical differences between current and expected training approaches, which showed that the current training approach is not completely meet the demand of pharmacists.

Discussion

Since the new health care reform in 2009, the hardware facilities of primary medical institutions in China have been gradually improved. At present, more attention has been paid to improving service capacity and quality [36, 37]. This study investigated the basic features, training status and training need of primary care pharmacists in Chinese mainland. In this survey, the geographical distribution of medical institutions and the layout of institutional types, and the distribution of basic characteristics of respondents were basically consistent with the distribution of relevant information in the Yearbook of health

Table 4 Survey on training approaches for primary care pharmacists

Questionnaire Composition	Current Training Approaches N(%)	Expected Training Approaches N(%)	P(Paired χ^2 Test)
Further study in school	45(7.05)	201(31.50)	< 0.001***
Short-term study in superior hospitals	248(38.87)	385(60.34)	< 0.001***
On-site guidance from superior hospitals	203(31.82)	304(47.65)	< 0.001***
Participate in meetings or special lectures	372(58.31)	310(48.59)	< 0.001***
Remote education	247(38.71)	261(40.91)	0.383
Internal training	275(43.10)	233(36.52)	0.007**
Apprenticeship	69(10.82)	98(15.36)	0.006**
Self-study or Proficiency test with training materials	78(12.23)	105(16.46)	0.014*
Other	22(3.45)	11(1.72)	0.035

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in the People's Republic of China 2021, which indicate this survey has a good representativeness.

Basic characteristics of surveyed pharmacists

The survey data reflected that the primary pharmaceutical workers in China are generally young and personnel with a bachelor's degree or below and a junior professional title or below account for the majority. It can be concluded that pharmaceutical work lack of high-quality professionals with high education, which is consistent with the conclusions of previous domestic studies [38, 39]. And it is related to the current requirements for professional pharmacists in China. At present, the primary and lower professional titles of health personnel in China are obtained through examinations. The qualification for assistant pharmacists is a technical secondary school/junior college degree in pharmacy. And the qualification for pharmacists is a technical secondary school degree in pharmacy and working as an assistant pharmacist for more than 5 years, or a junior college degree in pharmacy and 3 years of working experience in pharmaceutical services, or a bachelor degree in pharmacy and 1 year working experience in pharmacy service, or a master degree in corresponding field [40]. In general, only a technical secondary school degree in pharmacy related majors is required to be a pharmacist with a professional title, and the entry threshold for education is not high.

Among them, personnel of bachelor degree or above in the eastern part accounted for the highest, while the central region has the lowest proportion, and the same applies to the annual income distribution. The difference of education level and the distribution of income in the eastern, central and western region was statistically significant. In general, China's economic development level shows a stepwise decline from east to west. But a higher economic level is related to the level of education and the input of health resources, therefore, it is not consistent with the traditional perception that the academic degree and annual income of pharmaceutical professionals in the central region are lower than those in the western region.

The possible reason is that, in order to coordinate the balanced development of regions, the Chinese government has launched the Strategy for Large-scale Development of Western China [41, 42]. With the support of this policy, the western region has realized economic growth, and the medical and education have also been improved. This also reflects the current imbalance of primary medical and health resources among regions in China [43], and more medical and health resources should be tilted to the central and western regions in the future.

In this study, most of the primary care pharmacists entered the pharmacy field by receiving pharmaceutical education in colleges and universities, and most of the pharmaceutical staff had obtained professional title qualifications and licensed pharmacist qualifications, indicating that the professional level of pharmacists in China is relatively high. This is an updated result, as previous studies suggested that the professional level of primary pharmaceutical staff in China was not high and there are common issues about non-pharmaceutical personnel engaging in pharmaceutical work [26]. The results of this study indicate that the professionalism of primary pharmacists has been improved in recent years.

Training of pharmacists in primary medical institutions

With the continuous improvement of public demand for pharmaceutical services, it is more and more urgent for pharmacists to receive high-quality training. Previous studies have shown that the output of pharmacist training in China is less than one third of the actual demand [44]. The results of this survey showed that the training frequency of primary care pharmacists in China was relatively low within three years, about 67.9% of the respondents received less than three times of training, less than once a year on average, which is not conducive to the pharmacists to update their knowledge and improve the quality of pharmaceutical care. According to the continuing medical education regulations of China, the credit system of continuing education activities of hospital pharmacists is implemented, which is divided into class I

credit and Class II credit in credit management. Intermediate and above pharmacists from township health centers and above medical and health institutions shall have a total credit of no less than 25 credits per year, including 5–10 credits for Class I and 15–20 credits for Class II, and the two types of credits shall not be interchangeable. Junior professional and technical personnel in medical and health institutions at all levels shall obtain no less than 20 credits annually, and rural doctors shall obtain no less than 15 continuing medical education credits annually, without distinguishing between Class I and II credits [32, 45]. In order to promote the continuing education of primary health personnel, the National Health Commission of the PRC proposed in 2019 that medical staff at and below the county level should not be limited to credit classification, and the proportion of remote continuing medical education credits should be appropriately increased [46]. In general, the training opportunities obtained by primary care pharmacists in China do not meet the provisions of continuing education. In the future, resources investment in training and continuing education of primary pharmacists should be strengthened, and the continuing education of primary health personnel should be increased through “Internet +” and other means, and efforts should be made to improve the ability of primary healthcare.

In terms of training content, there is a statistically significant difference between the received and expected training content, indicating that this group still has obvious unmet training needs. Specifically, more than half the pharmacist accepted the related training of “drug policy laws and regulations, basic knowledge of pharmacy, safe and rational drug use, drug management, common disease diagnosis and treatment, these training contents also rank high in the training needs of pharmacists. Previous studies have also shown that China’s primary care pharmacists have a high training demand for “rational drug use, drug safety, diagnosis and treatment of common diseases, pharmaceutical theory, information on commonly used therapeutic drugs, and pharmaceutical related laws” [26, 47, 48]. These previous studies and this study all showed that these training contents should be the indispensable basic contents in the training of primary pharmacists. In addition, the surveyed pharmacists still had unmet needs for the contents of “clinical pharmacy knowledge, ability to deal with and analyze problems, and skills to provide pharmaceutical services”, which indicated that these contents may be the direction of development and efforts of follow-up training for them. Relevant national and local departments have issued regulations on the job responsibilities of pharmacists. The “Regulations on Pharmacy Administration in Healthcare Institutions” specify that pharmacists in medical institutions are responsible for drug procurement, prescription review

and evaluation, drug dispensing, design and implementation of drug treatment programs, ward rounds, inquiry, drug monitoring, and drug consultant [49]. Hunan [50], Hubei [51], Guizhou [52] and other provinces have issued special regulations for the pharmaceutical management of primary medical and health institutions, clarifying the main responsibilities of pharmaceutical personnel in primary medical and health institutions, which include drug policies and regulations, drug acceptance, formulation and management, collection of adverse drug reactions, drug consultant, prescription review, and popularization of drug knowledge. However, several surveys of primary care pharmacists in China [53–56] have found that drug dispensing, patient medication consultation, prescription review, adverse reaction monitoring and drug management are the most frequently carried out pharmaceutical services, while ward rounds, pharmaceutical consults, therapeutic drug monitoring and other pharmaceutical services are less carried out. Therefore, the work content of primary care pharmacists is not consistent with duty regulation. There is a gap between the job reality and the requirements of policy documents for responsibilities. The design of future training for primary care pharmacists needs to address this gap by focusing on knowledge of clinical pharmacy and service skills.

In terms of training approaches, there was a statistically significant difference between the current and expected training approaches of pharmacists in primary medical institutions, indicating that there was still a contradiction between the current situation and the demand for training approaches. Specifically, “short-term study in superior hospitals, on-site guidance of superior hospital personnel, participation in conferences/special lectures, remote education, and internal training” are the most common training approaches, and also with high demand. International studies have also shown that a mixed training approach is currently widely used [57]. In this study, the approach-“continue their education in schools”-is of significant unmet demand. However, the continuing education forms stipulated in the “Administrative Measures for Continuing Pharmaceutical Education” include academic conferences, academic lectures, special seminars, training classes, study classes, advanced training classes, business research and investigation, technology demonstration and remote teaching activities [58]. Up to now, more than 40 professional competency training courses for first-line pharmacists have been held with remote teaching mode [59]. Other surveys of training approaches showed that advanced training in superior medical institutions, expert lectures, and grassroots training bases account for the main part [29, 60]. According to regulations and current training practices, the need for “further education in school” may still not be met for some time to come.

In summary, the current training frequency of pharmacists in basic medical institutions is not up to the standard, and there are contradictions between the current situation and the needs in training content and training methods. These contradictions will affect the effectiveness of pharmaceutical service delivery. Therefore, China should standardize and improve the pharmacist training system as soon as possible, provide high-quality training and teaching for pharmacists purposefully, strengthen the training output, and effectively make up for the absence of pharmaceutical services. At the same time, it is also necessary for the government to increase financial investment to ensure that the education fees are used to implement the continuing education for primary care pharmacists smoothly.

The findings of this study informed the design and development of a continuing pharmaceutical education programme contextualised to primary pharmacist training needs. Further research is needed to assess the current training status and needs of different types of pharmacists in order to facilitate job-specific training and prompt the use of training resources efficiently. Moreover, future research should investigate pharmacists' perceptions toward CPD and CPE activities and the influence of gender and socioeconomic-related factors on training preferences.

This study has some limitations. Firstly, this study used a strict multi-stage sampling design, but due to the impact of COVID-19, field investigation could not be conducted in some cities, which may cause sample bias. However, on the whole, the social demographic information of the sample is relatively consistent with that of primary care pharmacists according to national statistics. Secondly, the questionnaire is prepared according to the literature, policy, training status without open question, which may not fully obtain expectations of pharmacists' training, only represents training content and forms that are currently available but not fully accessible to respondents. Thirdly, sampling strategy in this study is a non-probability sampling technique in which the study subjects are selected based on willingness to participate, which lead to self-selection problems.

Conclusion

In conclusion, there are still few pharmaceutical professionals with high education or above and intermediate or above professional titles in primary medical institutions in China, but their professional education has been improved, indicating that the education and training in China has achieved initial success. At the same time, from the perspective of primary care pharmacists, this study found the fundamental part and future direction of development of the training content and training form. Specifically, the basis of training content is “knowledge”

as the core, and its growth point is “service ability” as the core. Multi-mode mixed training forms are the characteristics of current training approaches, and school continuing education is an unmet development need. The results of this study can be used as a basis for further development and research into the needs of in-service training and continuing education for pharmacists.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-024-06522-8>.

Supplementary Material 1

Supplementary Material 2

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Author contributions

Sun QR & You YN: Conceptualization, Methodology, Writing, Investigation, Data Curation. Cao KJ: Writing, Investigation, Data Curation. Huang YK: Software, Methodology. Xi XY: Resources, Project administration.

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Data availability

The datasets generated during the current study are not publicly available because that are being used for other ongoing researches. But the datasets are available on reasonable request by contacting the corresponding author Xiaoyu Xi.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of China Pharmaceutical University (Project Number: CPU2019015). All methods were carried out in accordance with relevant guidelines and regulations. And all the participants filled out the informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Cadogan CA, Hughes CM. On the frontline against COVID-19: Community pharmacists' contribution during a public health crisis. *Research in social & administrative pharmacy*: RSAP. 2021;17(1):2032–2035. <https://doi.org/10.1016/j.sapharm.2020.03.015>
2. Tsuyuki RT, Johnson JA, Teo KK, et al. A Randomized trial of the effect of community pharmacist intervention on cholesterol risk management - The study of cardiovascular risk intervention by pharmacists (SCRIP). *Article. Archives Intern Med May*. 2002;27(10):1149–55. <https://doi.org/10.1001/archinte.162.10.1149>
3. Newman TV, San-Juan-Rodriguez A, Parekh N et al. Impact of community pharmacist-led interventions in chronic disease management on clinical, utilization, and economic outcomes: An umbrella review; Research Support,

- Non-U.S. Gov't; Systematic Review. Research in social & administrative pharmacy: RSAP. 2020;16(9):1155–1165. <https://doi.org/10.1016/j.sapharm.2019.12.016>
4. Berenguer B, La Casa L, de La Matta MJ, Martín-Calero MJ. Pharmaceutical care. 2004;10(31):3931–3946. <https://doi.org/10.2174/1381612043382521>
 5. Education ACfP. Continuing Professional Development (CPD) Overview. <https://www.acpe-accredit.org/continuing-professional-development/>
 6. Education ACfP. Accreditation Standards for Continuing Pharmacy Education. 2015.
 7. Crespo-Gonzalez C, Dineen-Griffin S, Rae J, Hill RA. Mental health training programs for community pharmacists, pharmacy staff and students: A systematic review.; Research Support, Non-U.S. Gov't; Review; Systematic Review. Research in social & administrative pharmacy: RSAP. 2022;18(11):3895–3910. <https://doi.org/10.1016/j.sapharm.2022.06.006>
 8. Anderson C, Arakawa N. Pharmacy Education Development. Editorial. Pharmacy (Basel, Switzerland). 2021;9(4)<https://doi.org/10.3390/pharmacy9040168>
 9. FIP. IPF. Continuing Professional Development/Continuing Education in Pharmacy: Global Report. 2014. https://www.fip.org/files/fip/PharmacyEducation/CPD_CE_report/FIP_2014_Global_Report_CPD_CE_online_version.pdf
 10. Setiadi AAP. The Development of Clinical Pharmacy in Indonesia. 2015.
 11. Ahmer Raza M, Aziz S, Noreen M, Anjum I, Raza SM. A Portrait of the Pharmacy Profession Globally: Pharmacist Universal Professional Identity and Establishment of Global Pharmacy Council. Innovations in pharmacy. 2022;13(1)<https://doi.org/10.24926/ijpv.13i1.4502>
 12. Hirvonen J, Salminen O, Vuorensola K, Katajauvuri N, Huhtala H, Atkinson J. Pharmacy Practice and Education in Finland. Pharmacy (Basel, Switzerland). 2019;7(1)<https://doi.org/10.3390/pharmacy7010021>
 13. Hu M, Yee G, Zhou N, Yang N, Jiang X, Klepser D. Development and Current Status of Clinical Pharmacy Education in China. Review. American Journal of Pharmaceutical Education. 2014;78(8):157. <https://doi.org/10.5688/ajpe788157>
 14. Li Y. Interpretation of Teacher Training Syllabus for Clinical Pharmacist Training Program (2023 edition). China Pharm. 2023;34(24):2945–50.
 15. Regulations on continuing education of professional and technical personnel. 2015.
 16. Center NHCCBaCE. Notice on Announcement of Training Bases for the Primary Health Workforce Capacity Enhancement Program. <https://www.ncme.org.cn/training-center/informationDetail?newsId=28801893>
 17. Guiding Opinions on Further Reforming and Improving the Assessment of the Titles of Grassroots Health Professionals and Technicians. 2015.
 18. Fang Y, Yang S, Feng B, Ni Y, Zhang K. Pharmacists' perception of pharmaceutical care in community pharmacy: a questionnaire survey in Northwest China. Health Soc Care Community Mar. 2011;19(2):189–97. <https://doi.org/10.1111/j.1365-2524.2010.00959.x>
 19. China MoEotP3Ro. National Standard for Teaching Quality of Undergraduate Specialised Categories in General Colleges and Universities. 2018.
 20. Huang Yuankai LY, Leng M. National survey on pharmaceutical care of primary healthcare institutions in China: status quo of pharmaceutical care provision. Chin J Hosp Pharm. 2019;39(02):109–15. <https://doi.org/10.13286/j.cnki.chinpharm.2019.02.01>
 21. Shen Jianghua WS, Zeng Y. Status Quo of Pharmaceutical Care and Training Needs Research of Primary Pharmaceutical Staff Based on 9 Provinces (Regions, Cities) Investigation. China Pharm. 2018;29(06):843–7.
 22. Shen B, Liu J, He JH, Zhu Z, Zhou B. Development and evaluation of an online training program based on the O-AMAS teaching model for community pharmacists in the post-COVID-19 era. Article. Front Public Health Sep. 2022;23:10906504. <https://doi.org/10.3389/fpubh.2022.906504>
 23. Hayat K, Li P, Rosenthal M et al. Perspective of community pharmacists about community-based antimicrobial stewardship programs. A multicenter cross-sectional study from China. Article. Expert Review of Anti-Infective Therapy. 2019;17(12):1043–1050. <https://doi.org/10.1080/14787210.2019.1692655>
 24. Wang J, Pei Y, Yu F, Kang Z, Zheng Y. Understandings. Attitudes, and Barriers About Diabetes Care: Analysis of Factors Influencing Community Pharmacists in China. Article. Diabetes Metabolic Syndrome and Obesity-Targets and Therapy. 2021;14:1999–2009. <https://doi.org/10.2147/dms0.S304066>
 25. Liang S, Deng H, Liu S, et al. Competency building for lay health workers is an intangible force driving basic public health services in Southwest China. Article. BMC Health Serv Res Aug. 2019;23(1):596. <https://doi.org/10.1186/s12913-019-4433-2>
 26. Hongmin L. Prevalence Survey and Evidence-based Research on Township Hospitals' Pharmacists Training in Gansu Province. Master. 2014. https://kns.cnki.net/kcms2/article/abstract?v=I4t8J_Kk_A-xfVNrXURRYLDgCtJ9QzH-bKWHOl59-ApNMZpx63JJlo545-JFUDfW1zm_1U55qzhxKpLLH0x65-VlqgnpAfclpba1ygfu3kOMkOp6l1cCuQXHOPayOWWfksprsr9TRNyYkp5Z4vySo0yDdnmFjC&uniplatform=NZKPT&language=CHS
 27. Hongmin L, Shuang L. Analysis of the current status of training of pharmacy personnel in township health hospitals in China based on literature study. Chin Rural Health Service Adm. 2015;35(09):1106–9.
 28. Rui H, Mengdan X. Investigation on Status of Knowledge, Skills and Training Needs for Pharmacy Staffs in Grass-Roots Medical Institutions. Pharm Today. 2016;26(04):280–4.
 29. Jianghua S, Shujie W, Yan Z. Status Quo of Pharmaceutical Care and Training Needs Research of Primary Pharmaceutical Staff Based on 9 Provinces(Regions, Cities Investigation. China Pharm. 2018;29(06):843–7.
 30. Qin H, Di W, Jing Z. Investigation on knowledge structure and job satisfaction rate of grassroots pharmacy staff from eight provinces in China. Anhui Med Pharm J. 2021;25(07):1467–70.
 31. China Health Statistics Yearbook. 2022.
 32. Letter Seeking Opinions on the Management Measures for National Continuing Medical Education Projects, the Continuing Medical Education Credit Management Measures. and the Management Measures for National Continuing Medical Education Bases. 2013.
 33. Department of Primary Health Care NHCotP. The Department of Primary Health Care of the National Health Commission. held a video conference to advance the work of the basic public health service projects for the year 2020. <http://www.nhc.gov.cn/jws/ptpxw/202008/519872a5918941da9c454a6ca3f7e934.shtml>
 34. Notice on the Issuance of the Implementation Plan for the 2020 Primary Health Talent Capacity Enhancement Training Project in Jilin Province. 2020.
 35. PRC NHCo. China Health Statistics Yearbook. 2020. <http://www.nhc.gov.cn/mohwsbwstjxxz/tjtjnj/202112/dcd39654d66c4e6abfd7b1389becd01.shtml>
 36. Twelfth Five-Year Plan for the National Basic Public Service System. 2012.
 37. PRC NHCo. Guiding Opinions on Strengthening the Performance Assessment of Primary Healthcare Organisations (Trial). Gaz Natl Health Comm People's Repub China. 2020;(07):23–30.
 38. Yan M, Yan L, Min W. Research on Problems and Countermeasures of Personnel Construction in Township Health Centers. Chin Health Service Manage. 2020;37(02):114–7.
 39. Yuankai H, Haijiao L, Meiling L. National survey on pharmaceutical care of primary healthcare institutions in China: Part 2. staffing of pharmacist team. Chin J Hosp Pharm. 2019;39(01):1–6. <https://doi.org/10.13286/j.cnki.chinhosp.2019.01.01>
 40. Guiding Opinions on Deepening the Reform of the Title System for Health Professionals and Technicians. 2021.
 41. Shenglong L, Yahua W, Angang H. The Effect of Western Development Program and Regional Economic Convergence in China. Econ Res J. 2009;44(09):94–105.
 42. Xi P, Zhongchang C. Impact Evaluation on China's Western Development Policy. China Popul Resour Environ. 2016;26(03):136–44.
 43. Liqing L, Xu Z, Yukun Z. Degree of Coordination between Primary Care Resource Allocation and Economic Development in Eastern, Central and Western China. Chin Gen Pract. 2021;24(22):2777–84.
 44. Jiancun Z, Yongpei W, qing Y. Strengthen the construction of hospital pharmacy talents and build a clinical pharmacist training system that meets the needs of medical reform. Chin Hosp. 2020;24(05):65–7. <https://doi.org/10.19660/j.issn.1671-0592.2020.05.20>
 45. Measures for Awarding and Managing Continuing Medical Education Credits. 2006.
 46. Circular on the Implementation of Measures to Reduce the Burden on the Grassroots and Improve the Work Related to Continuing Medical Education. 2019.
 47. Yufeng D, Quan H, Chen Z. Survey of pharmacy staff's basic situation and their related requirements in the town or community hospitals of Hubei province. Chin J Hosp Pharm. 2014;34(15):1309–13. <https://doi.org/10.13286/j.cnki.chinhosp.2014.15.18>
 48. Lin W, Jian L. Survey of pharmacy staff's basic situation in the town or community hospitals of Xianyang. Med Forum. 2016;20(11):1454–6. <https://doi.org/10.19435/j.1672-1721.2016.11.002>
 49. Regulations. on Pharmaceutical Management in Medical Institutions. 2011.
 50. Provisions on Pharmaceutical Management in Primary Healthcare Institutions in Hunan Province. 2019.
 51. Provisions on Pharmaceutical Management in Primary Healthcare Institutions in Hubei Province (Trial Implementation). 2019.

52. Code of Pharmacy Management for Primary Healthcare Institutions in Guizhou Province (Draft for Opinion). 2023.
53. Jialin G, Hui C, Shuling W. Current Situation of Pharmaceutical Care in Primary Medical and Health Institutions in China. *Chin Pharm J*. 2023;58(15):1422–9.
54. Huang Y, Yao D, Xi X, Wang Y, Yao W. Current status of pharmacy services in primary healthcare institutions in Jiangsu Province, China. Article. *Australian Journal of Primary Health*. 2020;26(5):424–430. <https://doi.org/10.1071/py20038>
55. Yuankai H, Yanhai L, Meiling L. National survey on pharmaceutical care of primary healthcare institutions in China: part 3. status quo of pharmaceutical care provision. *Chin J Hosp Pharm*. 2019;39(02):109–15. <https://doi.org/10.13286/j.cnki.chinhosp pharmacy.2019.02.01>
56. Lai W, Chunjing Z, Na W. Study on the Basic Situation of Pharmacy Staffs and the Development of Pharmaceutical Care in Chongqing Primary Health Care Institutions. *China Pharm*. 2018;29(10):1404–7.
57. Ballaram S, Perumal-Pillay V, Suleman F. A scoping review of continuing education models and statutory requirements for pharmacists globally. Article. *Bmc Med Educ*. Mar. 2024;27(1):343. <https://doi.org/10.1186/s12909-024-05322-4>
58. Association CP. Administrative Measures for Continuing Pharmaceutical Education. <https://www.cpa.org.cn/index.php?do=class&classid=297>
59. The 46th. professional competency training courses for first-line pharmacists. <http://www.ynpa.org.cn/news/2023-09-23/216.html>
60. Yongfei L, Haihong Z, Wenhui Z. Current status and analysis of the pharmacy workforce in primary care institutions. *China Health Ind*. 2018;15(32):179–80. <https://doi.org/10.16659/j.cnki.1672-5654.2018.32.179>

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