

Residents Preferences for Pharmacist-Managed Clinic in China: A Discrete Choice Experiment

Qingran Sun, Yi Wang, Pei Wang, Yuankai Huang, Xiaoyu Xi

National Medical Products Administration Key Laboratory for Drug Regulatory Innovation and Evaluation, China Pharmaceutical University, Nanjing, Jiangsu Province, People's Republic of China

Correspondence: Xiaoyu Xi, Email xixy@cpu.edu.cn

Purpose: This study aimed to survey and analyze the preferences for pharmacist-managed clinic among urban residents in China.

Materials and Methods: A discrete choice experiment was conducted in Nanjing, China. A D-efficient fractional factorial design was used to generate the questionnaire. Three models were used to investigate each patient's strength of preference and preference heterogeneity. The relative importance for each treatment attribute was also determined.

Results: 156 usable questionnaires (of 228 questionnaires sent out) were received. Respondents preferred pharmacist-managed clinics with the following characteristics: good pharmacists' knowledge and clinical medication practice competency, lower consultation fees, a dedicated consultation room, physician-pharmacist joint clinic, with pharmacists' knowledge competency receiving the highest priority. Latent class analysis revealed three classes (Experiential Type, Content Type and Economic Type) were identified based on respondents' preferences for pharmacist-managed clinics.

Conclusion: The respondents were willing to choose a PMC relative to the current situation. When deciding on a pharmacist-managed clinic, residents are driven by pharmacists' competency, consultation fee, availability of consultation rooms and collaborative care or independent pharmacist service. Differences in patients' preferences identified in the study provide information on pharmacist-managed clinics that meet residents' expectations.

Keywords: conjoint analysis, discrete choice experiment, pharmacist-managed clinic, preference study, patients

Introduction

Pharmacist-Managed Clinic (PMC) refers to a service mode that provides specialized pharmaceutical care on an outpatient basis, such as medication evaluation, medication consultation, patient education and suggestions for adjustment of medication regimen.¹ Previous studies have shown that PMC has a significant impact on improving medication adherence, improving clinical outcomes and reducing adverse drug events.²

It is cost-effective or cost-saving to use PMC against medication-related problems.^{3,4} In America, Japan and France, PMC has been a part of the pharmaceutical care routinely performed by pharmacists,^{5,6} whereas in developing countries, this service mode is not widespread.^{7,8} In China, PMC is still in the exploratory stage. Policies proposed by the National Health Commission of the People's Republic of China to improve the patient's medical experience through the establishment of PMC, such as "Opinions on Accelerating the High-quality Development of Pharmaceutical Care" and "The Program of Activities for Improvement of Patient Medical Experience (2023–2025)". China has issued special norms for the work content, hardware and software equipment of PMC and the qualification of pharmacists providing PMC. In October 2023, the National Technical Specifications for Medical Service Projects (2023 Edition) listed outpatient consultation by pharmacists as a pharmaceutical care project that requires payment for the first time in China.⁹

In China, the opening rate of PMC in health institutions is only 10.03% as of 2019¹⁰ and Chinese patients have a low acceptance of PMC.¹¹ This may be due to the fact that the utilization of PMC in China is largely dependent on patient preference. While some PMC models have elements of patient involvement (such as the measurement of patient satisfaction after implementation¹²), the major PMC models in China, such as the physician-pharmacist collaborative

clinic model or specialist clinic model, were primarily designed from the perspective of healthcare professionals and researchers and did not report including an in-depth investigation of patient perspectives and preferences in their initial design stage.^{13,14} Similar problems also exist in the PMC model in Taiwan (Province of China),¹⁵ the medication therapy adherence clinic model in Malaysia,¹⁶ and the PMC model in Japan.¹⁷

In China, patients currently tend to seek medication-related help from physicians rather than pharmacists, and there is a low awareness of PMC among patients and their families.¹⁸ Understanding the barriers and challenges that patients go through when receiving care provided by pharmacists can help pharmacists pay more attention to patient preferences during the treatment process, which could potentially enhance the monitoring and improvement of care quality.¹⁹ Therefore, gaining insight into patients' views and preferences regarding PMC and developing PMC models that align with these preferences could be a feasible way to increase the utilization rate and promote the development of PMC.

At present, we know little about Chinese population's preferences for PMC. Discrete choice experiments (DCEs) are a survey-based method underpinned by economic theory that allow the systematic quantification of preferences to help identify which characteristics (termed "attributes") of a good or service consumers like, the balance between these different attributes, and the relative value of each attribute.²⁰ DCE can simulate different PMC scenarios and are increasingly used to elicit patients' preference for a health intervention based on the trade-offs among important attributes that might affect the patients' behaviors in using medical care. DCEs have been applied to estimate patient preferences on Medicare medication therapy management²¹ and preferences of people with diabetes regarding pharmaceutical practice.²² This is the first DCE study to understand the patient preference for PMC in China. This study aimed to address two research questions: (i) to elicit the preference of patients when receiving PMC; (ii) to investigate whether there exists preference heterogeneity among respondents.

Method

Study Design

The DCE design and analysis was conducted following the checklist and reports of the International Society for Pharmacoeconomics and Outcomes Research Conjoint Analysis Task Forces.^{23–25}

Questionnaire Development

The first step is to define a number of attributes and attribute levels. We conducted a literature review, face-to-face interviews and expert consultations: 1) Literature review: The Trial Standards for Pharmacist-Managed Clinic served as the initial group standard for PMC publicly released in mainland China,²⁶ covering hardware facilities, types of PMC, service content, and fee for PMC. We searched for studies on preferences for PMC by using "(pharmacy service OR pharmacist-managed clinic OR medication therapy management clinic)" as a search formula in PubMed, NCBI, Web of Science and CNKI databases to collect attributes and levels of PMC. After literature review, 19 attributes ([Supplementary File 1](#)) were identified with the aim to supplement and support the attributes outlined in the Trial Standards for PMC. 2) Face-to-face interviews: Several residents were interviewed face-to-face to obtain a list of important attributes of PMC from the health service recipients' viewpoint. As a result, four attributes were removed. 3) Expert consultation: Three experts with several years of PMC experience were interviewed at Gulou Hospital in Nanjing to further assess the appropriateness of attributes and levels selected by patients and to reduce the number of attributes. They were asked to review and select 5–8 important attributes from a list of potential attributes.²⁷ After consultation, five attributes were jointly selected by three experts, two attributes were selected by two experts (pharmacy knowledge, competency in working practice), two attributes were selected by one expert, and six attributes were deemed to be of lesser importance. Finally, after expert Discussion, the attributes of pharmacy knowledge and competency in working practice were combined to form a new attribute, six attributes were included in this study ([Table 1](#)).

A D-efficient design was developed using SAS macro, yielding 36 choice sets that were further divided into three blocks to reduce respondents' cognitive burden. To check for internal consistency, one choice set within each block was duplicated. The final design included 13 choice sets in each block, which were randomly assigned to participants. For those who failed the consistency test, their data were excluded from the main analysis. Considering that the decision to

Table 1 Attributes and Attribute Levels for DCE

Attributes	Attribute Levels
Pharmacist-Managed Clinic Core (Focus)	Evaluation of medication regimen (core4)
	Developing or adjusting medication regimen (core3)
	Patient medication education and counseling (core2)
	Follow-up on medication (core1)
Frequency	Full or half-day clinic on weekdays (times3)
	3–4 times per week (times2)
	1–2 times per week (times1)
Type	Physician-pharmacist joint clinic (type3)
	Comprehensive pharmaceutical clinic (type2)
	Pharmaceutical specialist clinic (type1)
Consultation Room	Dedicated consultation room (place3)
	Shared consultation rooms with other clinics (place2)
	Only a consultation window (place1)
Pharmacists' knowledge and clinical medication practice competency	Good (ability3)
	Fair (ability2)
	Poor (ability1)
Fee	Free (fee3)
	Fixed fee (¥10–12) (fee2)
	Charge according to pharmacist title (refer to doctor registration fee) (fee1)

receive PMC is voluntary, an opt-out option was included, and the respondents were asked to choose among two hypothetical PMC and opt-out option.

In addition to DCE questions, sociodemographic characteristics of respondents were collected. We selected 2–3 communities through convenient sampling in Jiangning District, Nanjing City. A pilot study was conducted with 5–10 participants from each community. A few modifications were implemented based on the feedback from the pilot. An example of a final choice set was shown in [Table 2](#).

The questionnaire consisted of three parts: (1) an Introduction to the research background; (2) a demographic information questionnaire including gender, age and health status, etc.; and (3) DCE questionnaire. The questionnaire used in the survey is in the [Supplementary file 2](#).

Sample Design and Sampling

According to a rule of thumb suggested by Orme,²⁸ a sample size of 84 ($500 \times 4 / (2 \times 12) = 84$) would be desirable for the main effects model based on the number of attribute levels, alternatives and choice sets.

A multistage sampling Method was adopted to elicit respondents' preferences for PMC. In the first stage, cluster sampling was carried out. According to a national survey regarding the establishment of PMC in tertiary hospitals conducted in 2021,²⁹ a random number table was applied to select one city among the capital cities (or municipalities) of the provinces that ranked in the top 50% in terms of the number of available PMCs, and Nanjing City of Jiangsu Province was selected. In the second stage, a random number table was used to select two streets from each of the 11 districts in Nanjing, followed by

Table 2 An Example of Discrete Choice Question

	Option 1	Option 2	Option 3
Pharmacist-Managed Clinic Core (Focus)	Developing or adjusting medication regimen	Patient medication education and counseling	Neither.
Frequency	Full or half-day clinic on weekdays	3–4 times per week	
Type	Physician-pharmacist joint clinic	Comprehensive pharmacy clinic	
Consultation Room	Only a consultation window	Shared consultation rooms with other clinics	
Pharmacists' knowledge and clinical medication practice competency	Good	Poor	
Fee	Free	Fixed fee (¥10)	
Which one would you prefer?			

the selection of one community from each selected street. Within each community, 10 respondents were selected through convenient sampling and a total of 220 respondents were investigated. The inclusion criteria for the study were: 1) permanent urban residents, 2) ≥ 20 years, 3) no diseases that will affect autonomous judgment. Living in Nanjing for less than 6 months, suffering from diseases affecting autonomous judgment or lacking of informed consent will be excluded from this study.

Data Collection

The anonymous survey was conducted between July and August 2021. Firstly, data collecting volunteers were trained on accessing the potential participant, concepts related to DCEs, the content of PMC and the meaning of the choice sets and options in the questionnaire. And each data collecting volunteer was required to simulate a survey and pass the assessment before entering the final survey team.

Before enrolling in the survey, respondents were informed about the purpose and content of the survey. Electronic written consent was obtained from all respondents. Data were collected through one-by-one face-to-face interviews with respondents.

Statistical Analysis

Descriptive statistics were used to summarize respondents' characteristics. Conditional logit model (CLOGIT) and mixed logit model (MXL) were employed to examine preference heterogeneity. A subsequent latent class analysis (LCA) was carried out to categorize heterogeneous populations into more homogeneous classes. In the MXL, all attributes were coded as dummy variables, with coefficients of attribute levels assumed to follow a normal distribution to account for preference heterogeneity. The mixed models were estimated by simulated maximum likelihood using the Stata command developed by Hole,³⁰ and 1000 random draws were used to achieve stability. Akaike information criterion (AIC) was used to assess the statistical fit of the models. Lower AIC values indicate better fit.

The random utility theory provides the theoretical foundation for analyzing the DCE data. The following utility function was estimated:

$$U_n = \beta_0 + \beta_1 Core2 + \beta_2 Core3 + \beta_3 Core4 + \beta_4 Type2 + \beta_5 Type3 + \beta_6 Place2 + \beta_7 Place3 + \beta_8 Times2 + \beta_9 Times3 + \beta_{10} Ability2 + \beta_{11} Ability3 + \beta_{12} Fee2 + \beta_{13} Fee3$$

where β_0 is constant and β_1 – β_{13} are the coefficients reflecting the influence of a particular attribute level on the utility score. The negative (positive) signs on the β_0 indicate that, everything else being equal, respondents prefer (do not prefer) their current situation. The sign of the coefficient shows whether respondents prefer (positive) or do not prefer (negative) the particular level of the attribute compared to the reference level.

The partial log-likelihood method was used to examine the relative attribute impact.³¹ This was conducted by systematically re-estimating the models after dropping from the estimation one attribute at a time, and noting the respective log-likelihood value of the model. The attribute with larger partial effect-change in log-likelihood is considered as more important than other attributes included in the DCE. All statistical analyses were conducted using Stata 15.0 software.

Results

Sample Characteristics

A total of 228 respondents were recruited and 156(68.42%) of these successfully completed the consistency test. Respondents had a mean (standard deviation, SD) age of 44.98 (19.77) years, the vast majority (96.15%) were covered by at least one type of health insurance, and around half (57.05%) had a monthly income per capita of household more than 5000 CNY. Regarding experience of using PMCs, 67.31% had not experienced it. Only 17.94% of respondents (2.56% very well, 15.3% fairly well) were aware of PMCs (Table 3).

Table 3 Characteristics of Respondents Who Passed the Consistency Test

Characteristics	Percentage
Gender	
Male	46.15%
Female	53.85%
Age (Mean, SD)	44.98 (19.77)
Education	
Completed or did not complete primary school	13.46%
Completed Middle school	15.38%
Completed High school	27.56%
Bachelor or above	43.59%
Marital status	
Unmarried	29.49%
Married	61.54%
Divorced or widowed	8.98%
Occupational status	
Employed	48.08%
Retired	24.36%
Unemployed	27.56%
Medical insurance (multiple choice)	
Participation in basic endowment insurance for the urban working group	62.18%
Participation in social endowment insurance for urban and rural residents	41.67%
Participation in commercial medical insurance	14.10%
Uninsured	3.85%

(Continued)

Table 3 (Continued).

Characteristics	Percentage
Self-assessed health status	
Very poor	1.28%
Poor	7.69%
Fair	22.44%
Good	46.79%
Very good	21.79%
Chronic disease	
Yes	30.77%
No	69.23%
Monthly income per capita of household (CNY)	
<1000	1.28%
1000–3000	11.54%
3000–5000	23.72%
5000–10,000	31.41%
>10,000	25.64%
Have used PMCs	
Yes	32.69%
No	67.31%
Degree of knowledge of PMCs	
Very well	2.56%
Fairly well	15.38%
Fair	31.41%
Fairly poor	33.97%
Very poor	16.67%

Models Results

Table 4 presents the Results from the CLOGIT and MXL models. The goodness-of-fit measures suggest that the MXL model has a clear advantage, indicating that preference heterogeneity has a significant impact on the overall results. The results from both models are broadly comparable with respect to the signs and significance of the coefficients. For these two models, four attributes (the type, consultation room, fee of PMC and pharmacists' knowledge and clinical medication practice competency) were statistically significant. There was a strong preference for PMC compared to the opt-out option. Residents preferred PMCs with a dedicated consultation room (parameter estimate 0.65), good pharmacists' knowledge and clinical medication practice competency (parameter estimate 1.59), free (parameter estimate 1.15) and physician-pharmacist joint clinic (parameter estimate 0.36).

For the MXL, the significance of the SD around the mean values of the coefficients signifies the existence of unobserved preference heterogeneity in the data. Preference heterogeneity exists in the choice for most of the best levels versus the extremely

Table 4 CLOGIT and MXL Results

Attributes and Levels	Mixed Logit Model ($\beta \pm SE$)	Conditional Logit Mode ($\beta \pm SE$)
Asc	1.37±0.40**	0.57±0.22*
Pharmacist-Managed Clinic Core (Focus) (ref=core1)		
Core2	0.11±0.19	0.03±0.14
Core3	-0.01±0.15	-0.02±0.09
Core4	0.11±0.18	0.11±0.12
Type (ref=type1)		
Type2	0.17±0.12	0.21±0.08*
Type3	0.36±0.12**	0.34±0.08***
Consultation Room (ref=place1)		
Place2	0.06±0.12	-0.04±0.08
Place3	0.65±0.12***	0.30±0.07***
Frequency (ref=times1)		
Times2	0.06±0.12	-0.03±0.07
Times3	0.11±0.12	0.08±0.07
Pharmacists' knowledge and clinical medication practice competency (ref=ability1)		
Ability2	0.67±0.12***	0.37±0.08***
Ability3	1.59±0.20***	1.01±0.13***
Fee (ref=fee1)		
Fee2	0.44±0.12***	0.27±0.08**
Fee3	1.15±0.21***	0.67±0.14***
Standard deviations		
Asc	2.63±0.30	
Pharmacist-Managed Clinic Core (Focus) (ref=core1)		
Core2	0.75±0.28**	
Core3	0.05±0.30	
Core4	0.50±0.29	
Type (ref=type1)		
Type2	0.002±0.39	
Type3	0.51±0.18**	
Consultation Room (ref=place1)		
Place2	0.21±0.28	
Place3	0.48±0.17**	

(Continued)

Table 4 (Continued).

Attributes and Levels	Mixed Logit Model ($\beta \pm SE$)	Conditional Logit Mode ($\beta \pm SE$)
Frequency (ref=times1)		
Times2	0.21±0.23	
Times3	0.51±0.16**	
Pharmacists' knowledge and clinical medication practice competency (ref=ability1)		
Ability2	0.48±0.19	
Ability3	1.91±0.21***	
Fee (ref=fee1)		
Fee2	0.81±0.15***	
Fee3	1.80±0.21***	
Number of observations	5616	5616
chi-squared	389.29	373.13
Log likelihood	-1394.3724	-1589.0186
AIC	2844.745	3206.037
BIC	3030.479	3298.905

Notes: *p < 0.05, **p < 0.01, ***p < 0.001.

bad levels (eg “Good pharmacists’ knowledge and clinical medication practice competency” compared to “Poor pharmacists’ knowledge and clinical medication practice competency”, “PMC with a dedicated consultation room” compared to “PMC with only a consultation window”). This is not the case for the intermediate levels versus the extremely bad levels.

Relative Importance of the Attributes

The results of the analysis on the relative importance of the attributes in the MXL are shown in [Table 5](#) and the results of CLOGIT are in the [Supplementary file 3](#). The outcomes are listed by decreasing order of importance on the overall log likelihood of the model. The results demonstrated that moving from poor pharmacists’ knowledge and clinical medication practice competency to good competency was the most significant outcome for both models, which accounts for 46.33% of the log-likelihood in MXL. The second significant outcome was the fee schedule from charging no fee to charging according to pharmacists’ professional title (28.99%). Pharmacists’ knowledge and clinical medication practice competency was the most important attribute to respondents, followed by fee, consultation room and type of PMCs.

Preferences Heterogeneity

The preferences heterogeneity for the attributes and levels is shown in [Table 6](#). The goodness of fit of LCA model is presented in [Table 7](#). According to values for AIC and BIC, the model is the best when the number of classes is 3. The naming of each class was based on the statistically significant attributes within classes. These classes were labeled as Economic Type, Content Type and Experiential Type and the probability of respondents being in these classes was 22.4%, 29.2%, and 48.4%, respectively.

Respondents belonging to the Economic Type pay attention to the fees of PMC and pharmacists’ knowledge and clinical medication practice competency, and they prefer to pay as little as possible while getting as high-quality services

Table 5 Hierarchical Importance of Attributes Based on Partial Log-Likelihood Analysis

Attributes and Levels	Log Likelihood	Partial Effect-change in Log Likelihood	Relative Effect-%sum Of Change in Log Likelihood
None	-1394.37		
ability3	-1561.85	-167.48	46.33%
fee3	-1499.16	-104.79	28.99%
ability2	-1418.62	-24.24	6.71%
place3	-1415.49	-21.12	5.84%
fee2	-1412.52	-18.15	5.02%
type3	-1404.68	-10.31	2.85%
place2	-1397.83	-3.45	0.96%
times2	-1397.44	-3.07	0.85%
core2	-1397.42	-3.05	0.84%
times3	-1396.77	-2.39	0.66%
core3	-1396.35	-1.97	0.55%
core4	-1395.66	-1.29	0.36%
type2	-1394.55	-0.17	0.05%

Table 6 Latent Class Model Results with Only the Main Effects

Variable	Class1 Experiential Type		Class2 Content Type		Class3 Economic Type	
	β	p	β	p	β	p
ASC	2.420	0.000	2.388	0.224	-2.391	0.000
core2	-0.248	0.212	2.013	0.031	-0.268	0.343
core3	-0.285	0.073	1.422	0.015	-0.100	0.698
core4	-0.167	0.385	1.093	0.179	-0.228	0.442
type2	0.180	0.131	-0.264	0.525	0.272	0.247
type3	0.313	0.004	0.370	0.233	0.542	0.018
place2	0.097	0.432	0.019	0.960	-0.224	0.310
place3	0.359	0.002	0.769	0.022	0.339	0.166
times2	0.160	0.183	-0.456	0.212	-0.106	0.663
times3	0.212	0.056	-0.619	0.148	0.170	0.415
ability2	0.287	0.017	0.574	0.101	1.517	0.000
ability3	0.428	0.000	0.944	0.005	3.482	0.000
fee2	-0.100	0.396	1.785	0.000	0.495	0.019
fee3	-0.281	0.057	3.368	0.000	2.236	0.000
chronic	-0.570	0.197	-0.284	0.612	-	-
experience	0.575	0.187	-0.269	0.636	-	-
cons	0.493	0.100	-0.101	0.771	-	-
Class Share	0.484		0.292		0.224	

Table 7 Goodness-of-Fit of the LC Model

Measure	AIC	BIC
Latent class model	2854.789	3173.191

as possible. However, the constant for this type is significantly negative, indicating that individuals in this type tend not to choose PMC.

Among the three models, only respondents belonging to the Content Type in the LCA model pay attention to the core of PMC. They prefer pharmacists with good knowledge and clinical medication practice competency, who can provide low-cost medication education and counseling, and develop or adjust medication regimens in a dedicated consultation room.

Compared to the other two types, respondents belonging to the Experiential Type pay more attention to medical experience rather than cost. They prefer to be serviced by pharmacists with good knowledge and clinical medication practice competency in physician-pharmacist joint clinic with a dedicated consultation room.

Two variables, respondents' chronic disease status and prior PMC experience, did not significantly influence respondents' preferences across scenarios.

Discussion

In the MXL model, the results showed that respondents did not have a clear preference for different frequencies of the PMC. Higher frequencies of opening can facilitate easier access to services for patients. The reason that the attribute of frequency did not significantly influence respondents' choices for PMC may be that respondents may have been more willing to sacrifice this attribute for other attributes in the case of low PMC opening rate in China and insufficient awareness of PMC among patients.^{10,32}

In terms of the type of PMC, respondents prefer physician-pharmacist joint clinic. Previous studies of Chinese patients also found that patients preferred medication guidance from a combination of physicians and pharmacists,³³ rather than from pharmacists alone. Specialized PMCs are for patients with single system diseases and general PMCs are for patients with multi-system diseases, both of which are independently managed by pharmacists. Moreover, only about 18.48% of the hospitals with PMC in China have established physician-pharmacist collaborative PMCs, while the majority (60.00%) have established PMCs independently managed by pharmacists.¹⁰ In other words, pharmacist-independently managed PMCs are dominant in practice, but respondents did not show a clear preference for this status quo. Studies have found that physician-pharmacist collaboration improves medication therapy outcomes.^{34,35} In most ambulatory practices in America, the pharmacist works collaboratively with other health care providers.³⁶ Some reasons might lie behind the result. Firstly, physicians and pharmacists working together increase patient safety and improve services quality.³⁷ Secondly, pharmacists in China do not yet have the same professional skills as physicians, and their clinic experience is insufficient compared to that of physicians.¹¹ Patients have more trust in physicians and are accustomed to seeking help from them first if they encounter problems with their medication.³²

This study shows that fee for PMC is a crucial factor considered by respondents in a service package. Respondents prefer low cost. Other DCE studies performed on services provided by pharmacists found similar results, all showing that respondents preferred low-cost services.^{38,39} Different preferences are found in the respondents belonging to the experiential type, who find a lower fee less important when accessing knowledgeable physician-pharmacist joint services in a dedicated consultation room. The possible reason for this might be the potential benefit that they expect from the pharmacist services to help improve their medical experience and medication management.⁴⁰ In practice, respondents can get PMCs for free in China,¹⁰ which might be the reason behind these preferences.

Among the three classes of the LCA model, pharmacists' knowledge and clinical medication practice competence was the only attribute that was both positive and significant, indicating a clear patient preference for pharmacist competence in PMC. This is consistent with the MXL and CLOGIT models in which pharmacists' knowledge and clinical medication practice competence was the most important attribute. Other DCE studies indicated that participants express the strongest preferences for competence-based pharmacy attributes when selecting community pharmacy.⁴¹ Previous studies have also shown that the professional level of pharmacists affects the satisfaction of patients in PMC,¹² and patients have a high demand for pharmacists in PMC with extensive pharmaceutical knowledge, experience in the

use of medication and communication skills.⁴² Pharmacist's unique knowledge base and skill were considered to be elements of a successful ambulatory care practice in America⁴³ and determinants of willingness to pay for the pharmaceutical care in Saudi Arabia.⁴⁴ One reason for this strong preference for pharmacists' competence may be that in practice, only 10.03% of hospitals in China have PMCs, and PMCs are new to most of the respondents. When a new function of pharmacists is introduced into medical practice, patients will be concerned about the training and qualifications of pharmacists.⁴⁵

The consultation room of PMC is an important determinant for patients in the experiential and content types, but not for patients in the economic type. As shown in some studies, patients' preference for a dedicated consultation room may be related to their need for privacy protection.^{40,46} In previous studies, patients have emphasized the importance of privacy in the counseling process,⁴⁷ and unavailability of a private room might influence patients' active participation in seeking pharmacist consultation.⁴⁸ Similarly, American Society of Health-System Pharmacists guidelines state that patient education and consultation is most effective when conducted in a space that ensures privacy.⁴⁹

Interestingly, the core of PMC was not a significant determinant among respondents in the experiential and economic types (70.8%), and it was positively significant only among those in the content type. The low importance attached to this attribute by the majority of the respondents may be due to the lack of specific and official documentation of regulations on PMC in China at the time of the survey. And with the low opening rate of PMCs in China, patients do not know enough about the services, making it difficult for them to describe the services they want.^{47,50}

A better understanding of patients' preference for PMC is important for both training of pharmacists and development of sustainable PMC models. PMCs serve a heterogeneous population in hospitals, highlighting the need for pharmacists to realize that patients may have different preferences and needs. For example, different service models with reduced features could be prioritized for patients of different types. A relatively low opening frequency of PMCs is acceptable in the case of relative shortage of pharmacists. Pharmacists could target a service model with only reasonable fee and competent pharmacists for patients who place less value on other aspects (Economic Type). These findings support the need for a patient-centered approach to service delivery, designing PMCs which account for patient preference.

Limitation

A number of Limitations need to be noted when interpreting the results. Firstly, the sample size could be considered a limitation of the study. Although having a sample size of 156 is considered satisfactory for this type of survey, a larger sample size might have revealed larger preference heterogeneity. Secondly, the survey was conducted in Nanjing city, which may limit the generalizability of the findings to all residents. In addition, the study design assumed a main-effects model only, ie the assumption that the effect of each service attribute on utility is independent of other attributes. However, it may be possible that respondents' preferences for one attribute could depend on the level of another attribute. Thus, two-way and other higher-order interactions need to be investigated in future studies.

Conclusion

Overall, the respondents were willing to take a PMC. Participants expressed strong preferences for PMCs with competent and knowledgeable pharmacists, low fee, consultation room and collaborative service that including a doctor. These four attributes seem to be important facilitators for developing a PMC and ensuring confidence in the service. This study may bring valuable insight for health authorities in China regarding the treatment characteristics that patients value the most.

Abbreviations

PMC, Pharmacist-Managed Clinic; DCEs, Discrete choice experiments; CLOGIT, Conditional logit model; MXL, mixed logit model; AIC, Akaike information criterion; BIC, Bayesian information criterion; LCA, Latent Class Analysis.

Data Sharing Statement

The data that support the findings of this study are not openly available due to reasons of privacy and are available from the corresponding author upon reasonable request.

Ethics Approval

This study was approved by the Ethics Committee of China Pharmaceutical University (ID: CPU2019015) and it was conducted in accordance with the Declaration of Helsinki.

Consent to participate: Informed consent was obtained from all individual participants included in the study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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