

Community Hypertension Patients' Preferences for Family Doctor Service Packages in China: A Discrete Choice Experiment

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Purpose: Despite high coverage of China's Family Doctor Contract Services (FDCS), substantive utilization among hypertensive populations remains suboptimal. By decomposing service packages into granular clinical components, this study addresses the limitations of prior research focused on generic primary care attributes. We aim to quantify patient preferences and identify heterogeneity to align service delivery with specialized management needs, thereby facilitating the transition from nominal enrollment to substantive engagement.

Methods: A Discrete Choice Experiment (DCE) was conducted to community hypertension patients in Nanjing, China. Five key attributes were identified through literature review, qualitative interviews, and expert consultation. A Mixed Logit Model (MLM) and Latent Class Model (LCM) were employed to estimate attribute importance, willingness to pay (WTP), and preference heterogeneity.

Results: Analysis of 638 responses, with 596 participants passing the internal consistency check. The Mixed Logit Model demonstrated that all five attributes exerted a statistically significant influence on patient choices. In terms of relative importance, medication type was the primary driver, followed by the scope of services, payment method, appointment scheduling, and the annual contract fee. WTP estimates indicated positive valuations for original-brand medications, integrated clinical service bundles, and multi-source payment structures. Furthermore, the Latent Class Model identified two distinct subgroups reflecting preference heterogeneity within the sample.

Conclusion: Therapeutic certainty significantly outweighs economic considerations for community hypertension patients, with the pronounced preference for original-brand medications serving as a critical proxy for clinical safety. Policy should encompass state-led support for original-drug development while simultaneously enhancing institutional trust in generic alternatives through transparent quality evidence. Transitioning toward stratified, patient-centered management is essential to address preference heterogeneity and improve the substantive effectiveness of the family doctor system in China.

Keywords: hypertension, family doctor contract service, discrete choice experiment, patient preference, latent class model, willingness to pay

Introduction

Hypertension, widely recognized as a "silent killer",¹ represents an escalating global public health crisis that affects approximately one-third of the adult population worldwide.² Acting as a primary risk factor for cardiovascular diseases (CVD), chronic kidney disease, and other severe health issues.³ Hypertension exhibits a rising incidence, particularly in low- and middle-income countries,⁴ which contributes to significant morbidity and mortality. In China, the prevalence of hypertension is increasing at an alarming rate, currently impacting more than a quarter of the adult population.⁵ Notably, hypertension possesses three key features: its asymptomatic nature, chronic progression, and individual variability.⁶ These features directly shape the specific requirements and importance of its management. As a chronic disorder,

hypertension necessitates long-term intervention, relying heavily on lifestyle modification and medication compliance. Its management is characterized by sustained engagement, comprehensiveness, and a strong dependence on primary care.⁷ However, low patient involvement remains a major barrier; many patients discontinue medication due to the absence of perceptible symptoms, some struggle to adjust their lifestyles without professional guidance, and others face difficulties maintaining regular monitoring.⁸

To address these challenges, China has implemented the Family Doctor Contract Service (FDCS) as a cornerstone of its healthcare reform. The FDCS is designed to provide coordinated, continuous, and personalized primary care while simultaneously functioning as a gatekeeping mechanism to support hierarchical diagnosis and treatment. A central element of this system is the Family Doctor Service Package (FDSP), which delivers bundled clinical services tailored to chronic conditions through an annual contract fee. Despite this potential, multiple barriers hinder the full implementation of the FDCS. On the supply side, a shortage of qualified family doctors and excessive workloads result in insufficient capacity to meet growing healthcare demands.⁹ Simultaneously, demand-side barriers such as unmet expectations and persistent distrust in community-based providers undermine patient engagement.¹⁰ This creates a pervasive issue of nominal enrollment, where patients sign up for the service but remain inactive users.¹¹

The misalignment between FDCS offerings and actual patient needs suggests a fundamental oversight regarding core preferences. This deficiency necessitates service optimization guided by the Patient-Centered Care (PCC) framework, which prioritizes patient values to foster trust and enhance long-term outcomes.¹² Discrete Choice Experiments (DCE) provide a valuable methodological framework for exploring patient preferences.¹³ DCE enables researchers to quantify how patients evaluate the importance of different healthcare service attributes, including the types of drugs provided, appointment flexibility, scope of services, and service cost.¹⁴ By presenting patients with hypothetical choices involving trade-offs among various service attributes, DCE can identify both the most significant attributes for patients as well as their relative importance and the trade-offs patients are willing to make. This approach has been extensively applied in healthcare research to guide policy decisions and enhance service package design.¹⁵

While prior DCEs have examined general primary care in China, evidence on hypertension-specific family doctor service packages remains limited. Existing research frequently prioritize generic service attributes like physician level or waiting times. Consequently, they often overlook the clinical specificities and the “bundled” nature of FDSP.¹⁶ Specifically, the critical trade-offs between original-brand and generic medications, and the integration of advanced cardiovascular screenings within a contracted package, remain insufficiently explored. These elements are vital for hypertension management but are rarely addressed in previous broader DCE research.

This study extends the existing literature by shifting the analytical focus from broad primary care attributes to the granular clinical trade-offs within hypertension-specific FDSPs. While incorporating standard service factors such as appointment scheduling and payment methods, we disaggregate clinical components into specific attributes, such as the preference for original-brand versus generic medications and the inclusion of specialized cardiovascular screenings. By quantifying the willingness to pay (WTP) for these granular attributes and employing Latent Class Modeling to capture subgroup-specific decision logic, this research demonstrates how patients’ nuanced demands for clinical quality signals directly shape their valuation and acceptance of contracted service packages. These insights provide a more precise evidence base for policymakers to design service models that are optimally aligned with the long-term, specialized management needs of community-based hypertension patients.

Methods

This study employed a DCE to explore the preferences of hypertension patients for FDSPs in Nanjing, China. DCE is an established technique in health economics used to assess the relative importance of different service attributes by presenting respondents with hypothetical choice scenarios.¹⁷ In this context, DCEs allow for the identification of patient preferences regarding the attributes of family doctor services and the trade-offs they are willing to make. The methodology is based on Lancaster’s consumer theory, which suggests that individuals derive utility from the attributes of a service, and their choices reflect the relative importance of these attributes.¹⁴

Attribute Selection and Levels

The systematic determination of attributes and their respective levels is essential for ensuring the validity of a DCE. To guarantee the robustness of the selection process, we employed a multi-method approach, including a literature review, qualitative interviews with hypertension patients and family doctors, and expert consultations. The literature review identified several key attributes frequently examined in previous DCEs, such as medication type, scope of services, and payment options,^{15,18–20} which were then refined to address the specific needs of hypertension patients within China's family doctor system. Through this refinement, four core attributes were identified: medication type, scope of services, payment method, and contract fee. To further consolidate these components, we conducted semi-structured interviews with sixteen hypertension patients and eight family doctors. These in-depth discussions led to the identification of appointment scheduling as a pivotal emergent attribute, which participants emphasized as a prerequisite for improving service accessibility. Following the emergence of this critical component, thematic saturation was attained as no novel service-related themes or conceptual categories emerged during the final stages of qualitative data collection. This saturation confirmed the adequacy of our evidence base and justified the integration of the fifth attribute to ensure the experimental design precisely reflected the practical priorities of the target population. While patients emphasized medication type and accessibility, family doctors prioritized the scope of services and patient education. Additionally, remote monitoring and follow-up services were also recognized as essential components of this scope. Finally, a panel of healthcare professionals and policy experts reviewed the preliminary list of attributes and their levels, ensuring these attributes and their corresponding levels were both relevant and feasible under China's existing healthcare policies and practices. The final attributes and levels are summarized in Table 1.

A detailed explanation of each final attribute and its corresponding levels is provided below:

Medication Type

Medication Type is one of the key attributes influencing patient decisions.²¹ This attribute refers to the type of medication prescribed by family doctors to patients. It includes two categories: Original-brand Drugs and Generic Drugs. Original-brand Drugs are innovatively developed hypertension medications that have undergone rigorous clinical trials and are priced relatively higher. In contrast, Generic Drugs are medications with the same active ingredients as Original-brand Drugs but are produced at a lower cost—typically 50% less in price than their original-brand counterparts.²²

Table 1 Discrete Choice Attribute, Explanation and Levels

Number	Attributes	Explanation	Levels
1	Medication Type	The type of medication prescribed by family doctors to patients	Original-brand drugs Generic drugs
2	Appointment Scheduling	Whether patients can schedule their appointment times in advance	Yes No
3	Scope of services	The range of services included in the family doctor contract	① ①+② ①+②+③ ①+②+③+④
4	Payment Method	The financing approach for the family doctor contract	Personal payment; Personal payment + Public health subsidy; Personal payment + Public health subsidy + Insurance reimbursement
5	Contract Fee	The total annual fee required for enrollment in the family doctor service	¥100/year ¥300/year ¥500/year ¥700/year

Notes: ①Basic service. ②Blood pressure remote monitoring. ③Hypertension-related guidance. ④Cardiovascular system check-ups.

Appointment Scheduling

This attribute was identified through interviews with patients as another important factor.²³ Patients expressed a clear preference for advance appointment scheduling, as it helps minimize waiting times, enhances convenience, and reduces waiting time spent at the clinic. The categories for this attribute are Yes and No. “Yes” indicates patients can book appointments in advance to reduce waiting times, whereas “No” indicates that no appointment scheduling service is available, requiring patients to undergo the traditional registration and queuing process, which may result in longer waiting times.

Scope of Services

This attribute is defined as the range of services included in the family doctor contract and is considered an important factor.²⁴ This attribute has four levels: ①\①+②\①+②+③\①+②+③+④.

① Basic service: Defined as the provision of essential care, including the maintenance of health records and regular follow-up visits. ② Blood pressure remote monitoring: Patients receive devices for remote monitoring, with family doctors notified of abnormal readings and initiating follow-up when necessary. ③ Hypertension-related guidance: Encompasses lifestyle guidance (supporting patients in setting health goals), medication guidance (covering timing, dosage, and adjustments of antihypertensive drugs), and emotional management (providing psychosocial support). ④ Cardiovascular system check-ups: Includes annual tests such as dynamic ECG, ambulatory blood pressure monitoring, cardiac ultrasonography, and carotid ultrasonography.

Payment Method

Indicates the financing approach for the family doctor contract, with three levels: Personal payment; Personal payment + Public health subsidy; Personal payment + Public health subsidy + Insurance reimbursement.²⁵

Contract Fee

Defined as the total annual fee required for enrollment in the family doctor service, with four levels: CNY 100, 300, 500, and 700 per year.²⁶

Experimental Design and Data Collection

A D-efficient design was employed using Ngene software, with small “near-zero” priors (set at ± 0.0001) to minimize potential bias and ensure efficiency across a broad range of preference parameters.^{27,28} Specifically, we assigned a negative prior of -0.0001 to three attributes, namely medication type, appointment scheduling, and contract fee, to reflect their anticipated negative utility. Conversely, we assigned positive priors of 0.0001 to the scope of services and payment method to acknowledge their expected positive contribution to patient preferences. Twelve choice sets were generated via Ngene and distributed into two questionnaire versions. Each respondent completed seven choice tasks comprising six formal DCE tasks and one consistency check task. Each task presented three alternatives including two service packages and an opt-out option. To evaluate internal validity, we embedded two identical choice scenarios, namely Set 1 and Set 7, within each version. Respondents providing divergent choices across these identical sets were identified as failing the consistency check. Consistent with standard protocols, only the six formal tasks were included in the final model estimation, whereas Set 7 served exclusively for internal consistency assessment to ensure the statistical independence of observations. In addition to the choice tasks, the questionnaire collected demographic data encompassing age, gender, educational level, and monthly income to facilitate subsequent subgroup analysis. An example of the choice scenarios presented to the participants is illustrated in Figure 1.

The minimum sample size was determined using the rule of thumb proposed by Orme and Johnson: $n \geq (c \times 500) / (t \times a)$,^{29,30} where c represent the maximum number of levels for any attribute ($c=4$), t denotes the number of choice sets per respondent ($t=6$), and a is the number of alternatives per choice scenario ($a=2$). These parameters yielded a minimum requirement of 167 respondents for each questionnaire version. We conducted face-to-face surveys between May and July 2024 at four community health centers in Nanjing. To enhance the representativeness of the target hypertensive population, these centers were selected based on a comprehensive evaluation of population size, socioeconomic development, geographic location, and healthcare resource allocation. During these interviews, trained investigators

Attributes	Contract plan 1	Contract plan 2
Medication Type	Generic drugs	Original-brand drugs
Appointment	No	Yes
Scheduling		
Scope of services	Basic service+Blood pressure remote monitoring+Hypertension-related guidance(maintain health records + regular follow-up visits + annual physical examination + provision of related equipment for remote blood pressure monitoring + lifestyle guidance + emotional management.)	Basic service (maintain health records + regular follow-up visits + annual physical examination)
Payment Method	Personal payment	Personal payment + Public health subsidy + Insurance reimbursement
Contract Fee	CNY 300 per year	CNY 500 per year
Which contract plan would you choose?	☐	☐
In real life, would you choose this option?	☐ Yes	☐ No

Figure 1 An example of DCE question.

provided standardized verbal explanations to ensure that respondents accurately comprehended both the cumulative nature and the clinical substance of the “Scope of services” attribute. Beyond clarifying the incremental structure of the levels, investigators elucidated the specific content of each component, including operational procedures for remote blood pressure monitoring and the specific topics addressed in hypertension-related guidance. This comprehensive approach facilitated a clear differentiation between levels by explaining the substantive management services added at each stage, thereby ensuring that participant choices were grounded in a thorough understanding of the bundled service attributes.

Statistical Analysis

Data analysis was performed using a Mixed Logit Model (MLM), which accounts for both individual-level heterogeneity and random preference variation.³¹ The utility function for each choice set was specified as follows:

$$U_i = \beta_0 ASC + \beta_1 Medication\ Type + \beta_2 Appointment\ Scheduling + \beta_3 Scope\ of\ services + \beta_4 Payment\ Method + \beta_5 Contract\ Fee + \varepsilon_i$$

An Alternative-specific Constant (ASC) was included, where choosing service package alternatives was coded as 0, and opting out as 1. Here, U_i represents the utility that individual i derives from a specific given service package, and the β coefficients represent the relative importance of each attribute. We quantified the relative importance of each attribute by calculating its utility range and dividing it by the total sum of utility ranges across all attributes. This normalization process facilitates a direct comparison of the relative weights of attributes in the decision-making process. Furthermore, the WTP for each attribute was derived by dividing the coefficient of each non-cost attribute by the coefficient of the contract fee attribute, providing a monetary estimate of how much participants were willing to pay for improvements in specific service attributes. Particularly in instances where these estimates exhibit overshooting relative to the experimental cost vector, they function as a monetary proxy for the relative intensity of patient utility trade-offs rather than reflecting a literal market price. This interpretation acknowledges the potential for hypothetical bias and prioritizes the face validity of the preference intensity identified in the study.³²

$$WTP = -\frac{U_x}{U_{Fee}} = -\frac{\beta_x}{\beta_{Fee}}$$

The model was estimated using Stata 18 via the mixlogit command, employing 500 simulation draws to ensure stable and reproducible simulation results. Additionally, we applied a Latent Class Model (LCM) to capture unobserved preference heterogeneity and classify patients into distinct segments characterized by differing attribute valuations. In both the MLM and LCM, we treated all attribute levels and the ASC as random parameters, which were assumed to follow a normal distribution to capture preference variation across the population.

Results

Demographics of Respondents

Out of the 690 questionnaires initially distributed, the survey yielded 638 valid responses, reflecting an effective response rate of 92.46%. Of these valid samples, 596 participants (93.42%) successfully passed the internal consistency check. The mean age of participants was 66.60 ± 9.63 years, comprising 345 males and 293 females. Statistical analysis revealed no significant demographic disparities between respondents who passed the consistency check and those who failed it. Detailed demographic characteristics for the study sample are presented in Table 2.

Table 2 Demographic Characteristics of 638 Respondents in China

Characteristics	N=638 ^a	N=596 ^b	N=42 ^c	K^2	P
	N (%)	N (%)	N (%)		
Age				0.294	0.863
<60	125(19.59)	118(19.80)	7(16.67)		
60–70	284(44.52)	264(44.30)	20(47.62)		
>70	229(35.89)	214(35.90)	15(35.71)		
Gender				0.301	0.583
Female	293(45.92)	272(45.64)	21(50.00)		
Male	345(54.18)	324(54.36)	21(50.00)		

(Continued)

Table 2 (Continued).

Characteristics	N=638 ^a	N=596 ^b	N=42 ^c	K ²	P
	N (%)	N (%)	N (%)		
Marital status				0.115	0.735
Married	535(83.86)	499(83.72)	36(85.71)		
Unmarried ^d	103(16.14)	97(16.28)	6(14.29)		
Residence				1.604	0.205
Urban	544(85.27)	511(85.74)	33(78.57)		
County or below	94(14.73)	85(14.26)	9(21.42)		
Education level				3.223	0.200
Middle school or below	302(47.34)	284(47.65)	18(42.86)		
High school/vocational high school	244(38.24)	230(38.59)	14(33.33)		
College or above	92(14.42)	82(13.76)	10(23.81)		
Employment status				3.340	0.188
Employed	91(14.26)	89(14.93)	2(4.76)		
Unemployed	535(83.86)	496(83.22)	39(92.86)		
Other	12(1.88)	11(1.85)	1(2.38)		
Family per capita monthly income (CNY)				8.207	0.700
Below 1000	13(2.04)	13(2.18)	0(0.00)		
1000–3000	71(11.13)	68(11.41)	3(7.14)		
3000–5000	333(52.19)	316(53.02)	17(40.48)		
5000–10000	143(22.41)	132(22.15)	11(26.19)		
Above 10000	78(12.23)	67(11.24)	11(26.19)		
Health insurance type				3.928	0.391
Urban employee health insurance	511(80.09)	481(80.70)	30(71.43)		
Urban resident health insurance	102(15.99)	91(15.27)	11(26.19)		
Commercial insurance	2(0.31)	2(0.34)	0(0.00)		
Other	19(2.98)	18(3.02)	1(2.38)		
None	4(0.63)	4(0.67)	0(0.00)		
BMI^e				0.950	0.870
Normal	244(38.24)	227(38.09)	17(40.48)		
underweight/overweight/obese	394(61.76)	369(61.91)	25(59.52)		

Notes: ^aCommunity hypertension patients who completed the questionnaire. ^bCommunity hypertension patients who passed the consistency check. ^cCommunity hypertension patients who failed the consistency check. ^dIncluding unmarried, divorced, and widowed. ^eBody mass index.

Mixed Logit Model Estimation

The Mixed Logit Model was estimated through two distinct approaches, specifically by including (Model 1) and excluding (Model 2) the participants who failed the internal consistency check. As shown in the detailed comparative results presented in Table 3, the analysis revealed no significant differences in attribute-level estimates. Both models yielded identical findings regarding preferred attributes, with the signs of all coefficients remaining consistent across both estimation approaches. This suggests that these specific inconsistencies likely resulted from random fatigue or temporary inattention rather than systematic cognitive deficiencies. Therefore, to maximize the utilization of available data, Model 1 (N = 638), which included the full sample, was utilized for all subsequent analyses.

The results of the Mixed Logit Model analysis presented in Table 4 indicate that community hypertension patients demonstrate clear preferences for FDSPs. Attributes including medication type, appointment scheduling, scope of services, payment methods, and contract fees, all exerted a significant influence on patient preferences ($p < 0.05$).

The Mixed Logit Model further reveals that community hypertension patients prioritize specific attributes when selecting an FDSP. Medication type emerged as the most prominent factor ($\beta = -2.8124$, $p < 0.001$), where the transition from original-brand medications to generic drugs yielded a significant marginal disutility and a corresponding negative

Table 3 Comparative Analysis of Mixed Logit Model with Inclusion versus Exclusion of Samples Failing Consistency Checks

Attributes and Levels	Model1 (N=638) ^b		Model2 (N=596) ^c	
	β (SE)	95% CI	β (SE)	95% CI
Alternative Specific Constant (ASC)				
	-2.104(0.413)***	(-2.913,-1.295)	-3.073(0.483)***	(-4.020,-2.126)
Medication Type (Original-brand drugs ^a)				
Generic drugs	-2.812(0.246)***	(-3.295,-2.330)	-3.264(0.337)***	(-3,926,-2.603)
Appointment Scheduling (Yes ^a)				
No	-0.365(0.094)***	(-0.550,-0.180)	-0.423(0.111)***	(-0.641,-0.206)
Scope of Services (Basic service: Record-keeping and regular follow-ups ^a)				
Basic service+Blood pressure remote monitoring	0.360(0.146)*	(0.073,0.647)	0.460(0.172)**	(0.133,0.786)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance	0.696(0.138)***	(0.467,0.966)	0.792(0.160)***	(0.479,1.105)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance+Cardiovascular system check-ups	1.315(0.154)***	(1.012,1.617)	1.439(0.190)***	(1.068,1.811)
Payment Method (Personal payment ^a)				
Personal payment + Public health subsidy	0.319(0.121)**	(0.082,0.555)	0.325(0.138)*	(0.054,0.595)
Personal payment + Public health subsidy + Insurance reimbursement	1.102(0.138)***	(0.833,1.372)	1.211(0.171)***	(0.875,1.546)
Contract Fee				
	-0.003(0.000)***	(-0.003,-0.002)	-0.003(0.000)***	(-0.004,-0.002)
Sample size	638			
Number of observations	11484			
Log-likelihood ratio (LLR)	-2158.81			
Akaike information Criterion (AIC)	4353.619			
Bayesian information Criterion (BIC)	4485.896			

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. ^aSelected reference level. ^bSamples including those who failed the consistency check. ^cSamples excluding those who failed the consistency check.

WTP. Appointment scheduling was another key preference ($\beta = -0.3651$, $p < 0.001$), with patients valuing the ability to schedule appointments in advance to reduce waiting times and increase convenience, represented by a WTP of ¥139.034. Regarding the scope of services, patients preferred more comprehensive packages that included blood pressure remote monitoring, hypertension-related guidance, and cardiovascular system check-ups, with a WTP of ¥500.619 for such packages ($\beta = 1.3146$, $p < 0.001$). Payment methods also played a crucial role ($\beta = 1.1024$, $p < 0.001$), as patients favored multi-source payment structures involving personal payments, public health subsidies, and insurance reimbursements, reflecting a WTP of ¥419.797. Finally, although contract fees had a negative effect on choice behavior ($\beta = -0.0026$, $p < 0.001$), they were identified as the least prominent attribute.

The relative weights of each attribute are illustrated in Figure 2. Medication type had the highest relative importance (0.5718), followed by scope of services (0.1942), payment method (0.1592), and appointment scheduling (0.0742), while contract fees were the least important (0.0006).

Latent Class Model Estimation

We also applied the Latent Class Model (LCM) approach. Initially, we fitted the model with the number of latent classes ranging from 2 to 5. The values of AIC and BIC for different numbers of classes are presented in Figure 3. The model fit was evaluated using the AIC and BIC. The lowest values for both AIC (7412.383) and BIC (7293.632) were obtained with the 2 class model.

Table 4 Preferences, Willingness to Pay for Family Doctor Contract Services Among Community Hypertension Patients

Attributes and Levels	β (SE)	95% CI	SD (SE)	WTP/CNY (95% CI)
Alternative Specific Constant (ASC)				
	-2.1039(0.413)***	(-2.913,-1.295)	9.190(0.875)***	
Medication Type (Original-brand drugs ^a)				
Generic drugs	-2.8125(0.246)***	(-3.295,-2.330)	-2.313(0.235)***	-1070.991 (-1268.530, -73.479)
Appointment Scheduling (Yes ^a)				
No	-0.3651(0.094)***	(-0.550,-0.180)	0.488(0.234)*	-139.034 (-207.185, -70.883)
Scope of Services (Basic service: Record-keeping and regular follow-ups ^a)				
Basic service+Blood pressure remote monitoring	0.3604(0.146)*	(0.073,0.647)	-0.192(0.347)	137.256 (27.727, 246.785)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance	0.6962(0.138)***	(0.467,0.966)	-0.235(0.324)	265.113 (154.594, 375.633)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance+Cardiovascular system check-ups	1.3146(0.154)***	(1.012,1.617)	0.643(0.280)*	500.619 (372.182, 629.055)
Payment Method (Personal payment ^a)				
Personal payment + Public health subsidy	0.3185(0.121)**	(0.082,0.555)	0.194(0.544)	121.288 (29.275, 213.301)
Personal payment + Public health subsidy + Insurance reimbursement	1.1024(0.138)***	(0.833,1.372)	1.055(0.181)***	419.797 (301.252, 538.342)
Contract Fee				
	-0.0026(0.000)***	(-0.003,-0.002)	0.002(0.000)***	
Sample size	638			
Number of observations	11483			
LLR	-2158.81			
AIC	4353.619			
BIC	4485.896			

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. ^aSelected reference level.

Table 5 summarizes the findings of the choice preference analysis for the two identified latent classes of community hypertension patients. Across both subgroups, there was a consistent preference for original-brand medications, comprehensive FDSPs, and multi-source payment structures integrating personal payment, public health subsidies, and insurance reimbursement, along with a preference for lower annual contract fees. Nevertheless, each class also exhibited distinct preference patterns. Consequently, the choice preferences of community hypertension patients were categorized into two discrete latent classes as follows:

Class 1: referred to as the appointment-preferring type, exhibits preferences similar to those of Class 2 but with more distinctive characteristics. The defining features of this group are their greater likelihood of signing an FDSP ($\beta = -2.685$, $p < 0.01$) and their stronger preference for appointment scheduling in family doctor services ($\beta = -0.174$, $p < 0.01$). In terms of payment methods, this group shows a clear preference for a structure that combines personal payment with public health subsidies ($\beta = 0.211$, $p < 0.05$).

Class 2: defined as the observation type, differs from Class 1 in several respects. This group shows a lower likelihood of signing an FDSP ($\beta = 2.470$, $p < 0.05$) and does not attach importance to the availability of appointment scheduling.

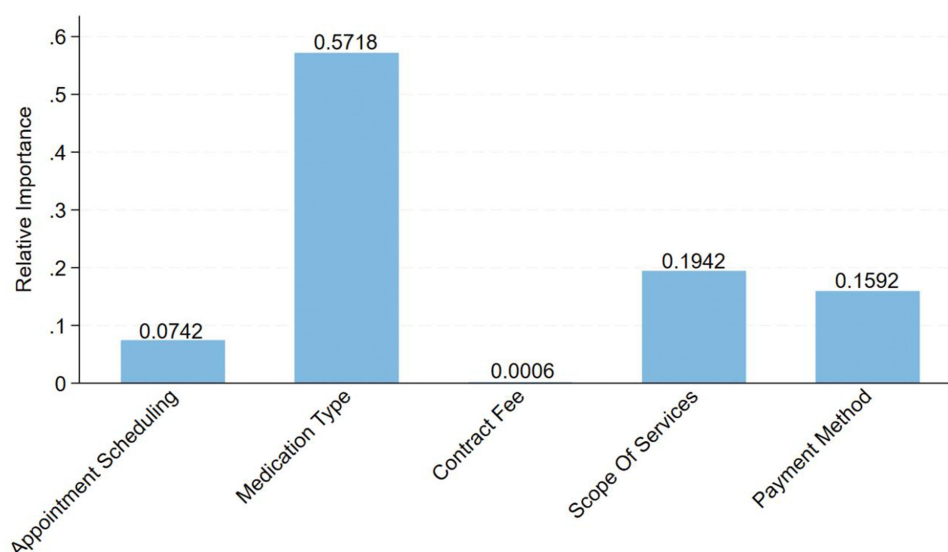


Figure 2 Relative Importance.

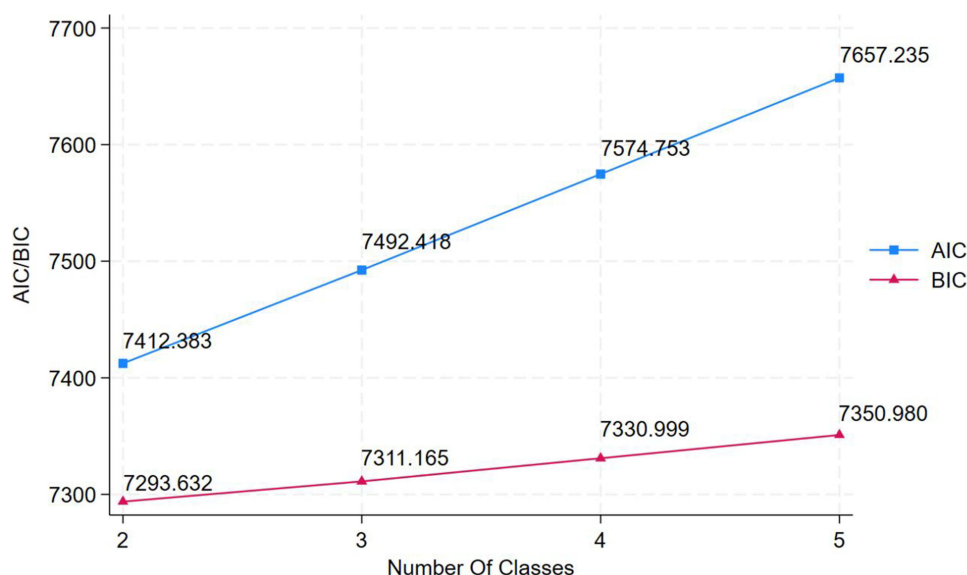


Figure 3 Trends of AIC and BIC Values by Number of Classes.

With regard to payment methods, this group shows no clear preference for the structure combining personal payment and public health subsidies.

The results of the demographic characteristic analyses are presented in Table 6, which shows that the included demographic characteristic variables exhibited certain numerical fluctuations in their coefficients for latent class membership in the LCM. Although the coefficients for certain variables—such as age 60–70 years (0.165), age >70 years (−0.276), and male sex (0.168)—showed numerical variation, none reached statistical significance ($p \geq 0.05$). This indicates that demographic characteristics did not influence preference heterogeneity between the two latent classes of community hypertension patients.

Table 5 Preference Heterogeneity Analysis Based on the Latent Class Model

Attributes and Levels	Class 1		Class 2	
	Coefficient (SE)	95% CI	Coefficient (SE)	95% CI
Alternative Specific Constant (ASC)				
	-2.685(0.154)***	(-2.986,-2.383)	2.470(0.440)***	(1.607,3.332)
Medication Type (Original-brand drugs ^a)				
Generic drugs	-1.373(0.058)***	(-1.488,-1.259)	-2.440(0.337)***	(-3.100,-1.780)
Appointment Scheduling (Yes ^a)				
No	-0.174(0.055)**	(-0.281,-0.067)	-0.420(0.253)	(-0.915,-0.075)
Scope of Services (Basic service: Record-keeping and regular follow-ups ^a)				
Basic service+Blood pressure remote monitoring	0.107(0.105)	(-0.098,0.312)	0.727(0.419)	(-0.095,1.549)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance	0.293(0.094)**	(0.108,0.477)	1.266(0.406)**	(0.470,2.061)
Basic service+Blood pressure remote monitoring +Hypertension-related guidance+Cardiovascular system check-ups	0.671(0.089)***	(0.497,0.846)	1.370(0.387)***	(0.612,2.129)
Payment Method (Personal payment ^a)				
Personal payment + Public health subsidy	0.211(0.082)*	(0.049,0.373)	-0.132(0.353)	(-0.824,0.560)
Personal payment + Public health subsidy + Insurance reimbursement	0.647(0.080)***	(0.489,0.805)	0.982(0.284)***	(0.426,1.538)
Contract Fee				
	-0.001(0.000)***	(-0.001,-0.0009)	-0.003(0.001)***	(-0.005,-0.002)
Average Membership Probability	0.727		0.273	

Notes: ***p<0.001,**p<0.01,*p<0.05. ^aSelected reference level.

Table 6 Demographic Characteristic Variable Analysis Based on the Latent Class Model

Characteristic Variable	Coefficient (SE)	95% CI
Age (<60^a)		
60–70	0.165(0.299)	(-0.420, 0.751)
>70	-0.276(0.315)	(-0.893,0.342)
Gender (Female ^a)		
Male	0.168(0.180)	(-0.186,0.522)
Marital status (Married ^a)		
Unmarried	-0.217(0.237)	(-0.683,0.248)
Residence (Urban ^a)		
County or below	-0.075(0.241)	(-0.549,0.398)

(Continued)

Table 6 (Continued).

Characteristic Variable	Coefficient (SE)	95% CI
Education level (Middle school or below ^a)		
High school/vocational high school	0.036(0.196)	(-0.349, 0.421)
College or above	-0.326(0.290)	(-0.895, 0.243)
Employment status (Employed ^a)		
Unemployed	0.087(0.332)	(-0.562, 0.737)
Other	-0.094(0.725)	(-1.515, 1.327)
Family per capita monthly income (CNY)(Below 1000 ^a)		
1000–3000	0.191(0.703)	(-1.187, 1.569)
3000–5000	-0.080(0.699)	(-1.449, 1.289)
5000–10000	-0.119(0.715)	(-1.520, 1.282)
Above 10000	0.229(0.742)	(-1.224, 1.683)
Health insurance type (Urban employee health insurance ^a)		
Urban resident health insurance	-0.444(0.240)	(-0.915, 0.025)
Commercial insurance	-25.896(6943.043)	(-13634.01, 13582.22)
Other	-0.465(0.614)	(-1.670, 0.738)
None	0.482(1.191)	(-1.853, 2.817)
BMI (Normal ^a)		
Underweight/overweight/obese	-0.122(0.178)	(-0.472, 0.227)

Note: ^aSelected reference level.

Discussion

The FDCS system serves as a cornerstone of primary healthcare development in China. However, despite its expanding coverage and continued government support, persistent challenges remain regarding both its substantive utilization and overall effectiveness. A primary concern is the disparity between the significant potential of the FDSP and the relatively low level of public engagement. This study bridges this gap by employing a DCE to quantify preferences specific to hypertension management, moving beyond general chronic disease services to provide a robust evidence for targeted policy development.

The principal finding of this study is that medication type was the most influential attribute in patients' choices regarding FDSPs. Specifically, the transition from original-brand to generic medications yielded a negative WTP, which reflects the substantial disutility that patients associate with generic alternatives. This magnitude represents the robust intensity of patient utility trade-offs rather than a direct market price.³² The results are consistent with patterns reported in prior research on medication preferences,^{33,34} yet they provide important insights specific to hypertension patients. Whereas the general population often places greater emphasis on cost or accessibility, the lifelong treatment demands of hypertension lead these patients to prioritize perceived efficacy and safety.³⁵ This study extends the existing literature by examining patient preferences for specific medications categories, particularly regarding the distinction between original-brand drugs and generic drugs. The results reveal a clear patient preference for FDSPs that provide original-brand drugs. This preference is consistent with findings from studies in the United States,³⁶ which reported that although patients are generally willing to use generics, they nonetheless demonstrate a preference for original-brand drugs, a pattern attributed to concerns regarding efficacy and safety. This preference aligns with the "Price-Quality Heuristic" within a patient decision-making framework, where individuals rely on brand reputation as a proxy for clinical quality to mitigate perceived risks associated with chronic disease progression.^{37,38} In contrast to our findings, a study conducted in eastern China reported that rural patients with multiple chronic conditions exhibited a stronger preference for domestic generic

drugs over original-brand drugs, citing factors such as perceived affordability and greater trust in these medications.³⁹ This discrepancy may stem from differences in economic status and educational level between the two study populations.

Additionally, our study underscores the importance of service content within FDSPs. Specifically, compared with basic services such as medical record management and routine monitoring visits, hypertension patients expressed a stronger preference for packages incorporating remote blood pressure monitoring, specialized hypertension guidance, and cardiovascular screenings. This finding is consistent with previous studies,^{24,40} which identified service content as a key determinant of the willingness of patients to sign an FDCS contract. Our study further details the demand for integrated services, including guidance for hypertension and cardiovascular screenings, rather than standalone remote monitoring, which appears less favored. This indicates that patients perceive cardiovascular health as a primary concern. Notably, these attribute levels, particularly the inclusion of comprehensive cardiovascular screenings, are specifically modeled after established pilot policies in developed regions of China. While intensive examinations such as cardiovascular ultrasonography involve substantial resource costs, their implementation is facilitated by the tiered diagnosis and treatment system where community health centers collaborate with specialist hospitals. This grounding in existing pilot scenarios ensures that the quantified preferences reflect realistic policy trajectories rather than idealized service bundles. While patients prioritize integrated care, the relatively low preference for remote blood pressure monitoring can be elucidated through the Technology Acceptance Model (TAM).⁴¹ Specifically, elderly patients may exhibit low perceived ease of use due to digital literacy barriers, or low perceived usefulness if they do not perceive remote data as a necessary replacement for traditional face-to-face consultations.^{42,43} This suggests that the mere inclusion of advanced technology is insufficient; the FDSP must emphasize the clinical value of technology through established medical channels to enhance patient acceptance. In addition, integrating services such as remote monitoring and specialized hypertension guidance remains crucial to improving hypertension management within the community and meeting patient needs.^{44,45}

In relation to payment methods for FDSPs, our research demonstrates that community hypertension patients prefer a multi-source shared payment model, aligning with general trends in healthcare payment preferences.²⁵ According to the Financial Risk Protection Theory,⁴⁶ a diversified funding structure incorporating personal payments, medical insurance, and public health subsidies is superior to single source models because it effectively spreads financial risks and minimizes the likelihood of catastrophic health expenditure among patients with chronic diseases. By optimizing the cost sharing ratio, this multi source approach enhances the perceived affordability of the FDSP, ensuring that treatment adherence is not compromised by the direct out of pocket capacity of a patient.

The study identifies the annual contract fee as the least prominent attribute influencing enrollment decisions, consistent with previous research.^{33,40} Hypertension patients prioritize clinical benefits, such as medication quality and comprehensive service content, over marginal financial variations. In chronic disease management, brand reputation and service comprehensiveness serve as potent signals of clinical excellence, effectively rendering direct economic costs secondary to therapeutic certainty.³⁷

The LCM identified two distinct patient subgroups: the first accounted for 72.7% of the sample and was labeled the appointment-preferring type, while the second accounted for 27.3% and was labeled the observation type. This subgroup classification has important implications for tailored service delivery. The majority subgroup, the appointment-preferring type, exhibited a strong willingness to sign up for FDSPs and placed high priority on advance appointment scheduling. This preference pattern reflects the practical needs of many elderly patients in this subgroup: they face mobility challenges and aim to reduce in-clinic waiting time.⁴⁷ In contrast, the observation type exhibited low willingness to sign up for FDSPs and showed indifference to appointment-related services. This pattern likely stems from persistent distrust in the competence of community healthcare providers, which remains a pervasive barrier in China's hierarchical medical system.^{48,49}

To address issues of uptake and effectiveness in China's FDSP for hypertension patients, we propose the following targeted strategies, while considering the practical difficulties of implementation: First, the state should promote the research and development of original-brand medications to ensure that service packages are grounded in high clinical standards. Although current centralized volume-based procurement policies prioritize the utilization of generic drugs, the pronounced preference for original brands identified in our study underscores significant barriers in the public acceptance of generic alternatives. To facilitate the effective implementation of existing generic drug policies, authorities should

enhance transparency by publicizing “consistency evaluation” results and providing clear efficacy data. This dual approach addresses patient demands for therapeutic certainty while correcting long-standing misconceptions that lower-cost medications are inherently inferior. Second, a subgroup-tailored service delivery model should be implemented to provide subgroup-tailored services: providing advance appointment scheduling for the appointment -preferring group and focusing on “personal payment plus public subsidy” models for the observation type. While promising, this approach could encounter obstacles regarding the increased administrative burden on family doctors, which may lead to provider burnout if not managed with additional personnel or optimized digital workflows.

Third, to improve the acceptance of remote monitoring among older populations, community health centers should offer hands-on training programs to bridge the digital literacy gap. To ensure long-term sustainability, these initiatives could leverage peer-support models or volunteer-led technical guidance to optimize human resource allocation and minimize operational costs. Furthermore, the development of a centralized digital platform is essential to integrate fragmented monitoring data, thereby enhancing clinical safety and ensuring seamless data management within the existing primary care infrastructure; finally, prioritize service quality over cost adjustments by focusing on enriching service types and improving service quality rather than reducing contract fees, thereby effectively boost patient engagement with FDSPs.

Conclusions

Our study provides a comprehensive quantification of hypertension-specific preferences for FDSPs and reveals that therapeutic certainty significantly outweighs marginal economic considerations among patients with chronic conditions. This prioritization is evidenced by the primacy of medication quality, where the pronounced preference for original brands functions as a proxy for clinical safety, which renders annual contract fees the least influential factor in decision-making. These findings suggest that primary care optimization should encompass state-led support for original-brand medication development while simultaneously enhancing institutional trust in generic alternatives through transparent quality evidence. Furthermore, addressing digital literacy barriers remains crucial to improving technology acceptance for remote management. Ultimately, transitioning from standardized service bundles to stratified, patient-centered management is essential to address inherent heterogeneity and improve the substantive effectiveness of China’s FDCS in meeting the specialized needs of hypertensive populations.

Strengths and Limitations

This study has several strengths in design, data, analysis, and practical relevance. Attribute identification combined literature review, patient and doctor interviews, and expert consultation, reducing subjectivity and ensuring alignment with patient needs and policy context. Data were collected through face-to-face surveys in four community health centers, yielding 638 valid questionnaires with high completeness and consistency. Analytically, both MLM and LCM were applied to quantify attribute impacts and willingness to pay while capturing preference heterogeneity. The focus on community hypertension patients resolves a critical evidentiary void in prior research, and the findings suggest patient-driven strategies to optimize FDCS in hypertension management.

This study also has several limitations. First, given the the inherent limitations of DCE approach, we could not incorporate additional attributes. Consequently, the high valuations for core attributes led to “WTP overshooting” where estimates exceeded experimental cost thresholds. This suggests that while preferences are intense, the WTP values should be interpreted as measures of utility intensity rather than absolute market prices. Second, the study sample for this study was recruited from several community health centers in Nanjing, which may not fully represent other regions in China and thus may limit the generalizability of the results. Third, the demographic characteristics considered in this study were insufficient to fully explain the sources of preference heterogeneity among community hypertension patients. Future research should incorporate a broader set of demographic characteristics to better clarify these subgroup differences.

Data Sharing Statement

The data that support the findings of this study are available on request from the corresponding author, Yuan He. The data are not publicly available due to privacy or ethical restrictions.

Ethics Approval and Consent to Participate

This study was approved by the Institutional Ethics Committee of Nanjing Medical University (No. 2021378) and complies with the Declaration of Helsinki. With the approval of the Ethics Committee, written consent was waived, and verbal consent was permitted. Given the limited literacy skills of some patients, to ensure that all patients fully understood the purpose and procedures of the study, and to ensure the study progressed as planned, written informed consent from patients was waived, allowing for verbal informed consent instead. To guarantee the transparency and accuracy of verbal consent, The following recording methods were adopted: (a) After obtaining verbal consent, research team members immediately documented the consent details, including the date, time, and location; (b) each verbal consent record was confirmed by the signatures of two research team members to ensure the authenticity of the record. With these measures, we ensured the integrity of informed consent and the ethical compliance of the study.

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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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Disclosure

The authors declare no conflicts of interest in this work.

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