

Research Article

Exploring Residents' Healthcare Utilization under the Family Physician Contract Service System in China: Implications for Primary Healthcare

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Chinese government promoted a family physician contract service system in order to establish a tiered healthcare system in June 2016, but there was little evidence to assess the policy performance. This study aimed to examine the association of family physician contract services with the healthcare utilization of community residents in urban China. A cross-sectional face-to-face survey was conducted from July to September, 2019, in four advanced and exemplary cities for family physician contract services in China. A multistage cluster random sampling method was adopted to recruit residents aged 18 and above, and a total of 1508 participants were included in this study. The count model and logit regression were adopted to examine the associations between family physician contract service and healthcare utilization, and the potential bias was addressed using the propensity score matching (PSM) method. There was an increase in number of monthly primary care visits and annual referrals for contracted residents compared to noncontracted residents. Participants who had contracted with a family physician were more likely to choose a primary healthcare facility after illness than those who had not. However, no significant change was found in the number of annual hospital admissions between contracted and noncontracted residents. Family physician contract services may effectively strengthen the use of primary care facilities by community residents and promote the formation of a tiered healthcare system in China.

1. Background

Family physicians also referred to as general practitioners or family doctors, provide continuous, comprehensive, and coordinate health service extensively at the primary level as the gatekeepers of residents' health [1, 2]. Family physicians collaborate with patients to identify their healthcare needs and choose services that effectively meet the needs [3]. Since the Alma Ata Declaration clarified the concept of primary healthcare (PHC) in 1978, PHC has been considered as the key to attaining the goal of "Health for all" and safeguarding health as a fundamental human right [4]. As the core of PHC, the family physician system has made considerable progress and has become an essential component of health service delivery systems in countries and regions. In PHC,

the continuity of care is maintained through the long-term relationship between family physicians and patients. This effective physician-patient relationship allows for the transmission of two-way information, and family physicians acknowledge residents' family and their community [5]. Scholars have emphasized the essential features of family the services by physicians, such as the provision of first-contact care, long-term patient-centered continuity, and coordination of care, including referrals [6]. To date, more than fifty countries and regions around the world have implemented family physician service systems, including Britain, the United States, Australia, Canada, and Cuba [7]. The family physician system has shown great potential to improve the overall health of the population and reduce medical costs [8, 9].

The practice of family physicians in China can be traced back to the “barefoot doctors” system from 1949 to the late 1970s, which inspired the worldwide movement for primary healthcare and contributed substantially to a reduction in the burden of communicable, maternal, and neonatal diseases, especially for rural residents [10–12]. However, the “barefoot doctors” system and primary care gradually collapsed after China’s market-based reforms in the healthcare sector during the 1980s [11], leading to a process of self-reinforcement empowering the hospitals [13, 14]. The Chinese government launched a new round of healthcare reform in 2009 to rebuild primary health care and started to establish a general practitioner system in 2011 [15, 16]. Since then, various forms of family physician contract services have been piloted in different regions [17], and a document was issued in 2016 to promote family physician contract services for residents [18]. According to the document, long-term contract service provided by family physicians should be human-centered, family-oriented, and aimed at maintaining and promoting holistic health. Chinese residents could freely sign contracts with a family physician team which consists of general practitioners, nurses, and public health workers. The team was responsible for delivering preventive care, basic health, and referral services, and it was encouraged to serve as a gatekeeper for the contracted residents. However, China did not make it compulsory for patients to visit family physicians as their first point of contact, and a study in Beijing also indicated that patients who preferred free choice of doctors experienced better relational continuity with specialists rather than primary care providers [19]. Thus, we need to evaluate whether the family physician contract service would promote the choice and use of primary healthcare for community residents in China.

The development of family physician contract service is a main component of the government’s efforts to establish a tiered healthcare system [20]. Research at the national level found that a tiered healthcare system could significantly improve the quality performance in clinical settings and save treatment costs for patients with chronic diseases in China [21]. Among them, family physician contract services and PHC played a huge role in changing primary healthcare utilization and promoting health outcomes. In addition, family physicians as “gatekeepers” also ensure equity by judiciously matching services like specialty referrals to health care needs and thus reduce patients’ self-referrals [3].

As health care utilization is influenced by contextual characteristics, individual characteristics, and health outcomes, one of the most widely used frameworks is the behavioral model of health service utilization developed by Andersen; contextual and individual characteristics are further classified into predisposing characteristics, enabling resources, and health needs [22, 23]. Whether residents contracted with a family physician could be an individual enabling resource factor influencing their healthcare utilization. Several studies from other countries have explored the possible determinants of healthcare utilization, including

the family physician system. Another study from Belgium suggested that initial differences in contacts with a family physician and specialist between the different socioeconomic groups disappeared among the elderly [24]. As part of health systems, the presence of family physicians might increase the likelihood of healthcare utilization [25]. The frequency of patient visits was associated with the family physician-patient relationship, but not in an independent way [26]. However, in terms of family physician contract services, it was revealed that the increased utilization of PHC services in the pilot areas of the private practitioner contract system in South Africa might be the result of other health reforms rather than contracting with a family physician [27]. As for China, most relevant domestic studies have focused on residents’ awareness of family physician contract services, willingness to contract, factors influencing the contract decision, and the implementation of family physician contract service systems [28–30]. In addition, several studies have indicated that compared with the reference group of patients without a family physician, hypertensive patients who receive care from their own contracted family physicians have a higher BP control rate [31]. The family physician contract services policy also appeared to influence the perceived participation of patients in their healthcare [32]. Healthcare utilization is the quantification of services utilized by individuals for the purpose of maintaining health and well-being, preventing and treating health problems, or obtaining information about one’s health status and prognosis [33]. As for the relationship between family physician contract services and healthcare utilization, some studies indicated that signing up with family physicians has positive associations with public healthcare utilization, in term of cervical cancer screening and health education [34, 35]. In addition, signing service contracts with family physicians had a positive association with utilization of primary health care services [36] and improved patients’ perceived primary care quality [37]. However, limited information was available about the associations of family physician contracts on primary care outpatient, inpatient, and referral utilization of residents after the implementation of the family physician contract service system in China.

To fill this evidence gap, this study explored the associations between family physician contract service and community residents’ healthcare utilization using the propensity score matching (PSM) method and provided possible policy implications.

2. Materials and Methods

2.1. Study Design and Data Sources. A cross-sectional field survey was conducted from July to September, 2019, in four advanced and exemplary cities for family physician contract service system in China, including Xiamen City in Fujian Province, Hangzhou City in Zhejiang Province, Changning District in Shanghai Municipality, and Beijing Municipality. A multistage cluster random sampling method was adopted among local permanent residents aged 18 and above. The sample size of participants was calculated by the following formula:

$$n = \frac{z_{1-\alpha/2}^2 \times p \times (1 - p)}{\delta^2} \times i. \quad (1)$$

Based on the contract rate (p) in each city in 2017 or 2018 (approximately 36.3% in Xiamen [38], 31.5% in Hangzhou [39], 50.1% in Changning District, Shanghai [40], and 35.0% in Beijing [41], and the rates have been supplemented by insights from interviews of local health commissions leaders from May to June, 2019), a maximum permissible error of 5% ($\delta = 0.05$), and an allowance of 8% for invalid samples ($i = 1.08$), the sample size was calculated. Two community health centers out of four cities were randomly selected according to geographic location and local government recommendations, and evenly distribute the number of samples to be investigated to the two streets where they are located. Probability-proportional-to-size sampling was carried out according to the number of residents in two streets. Then, four resident committees were randomly selected from each street; a simple random sampling method was used to select two estates in a cluster from each resident committee. Finally, among the selected resident estates, a simple random sampling method was used to select 24, 22, 26, and 24 households in Xiamen, Hangzhou, Shanghai, and Beijing City, respectively. The sample sizes for each city were 384, 358, 415, and 378, respectively, with a total of 1535 community residents interviewed. Figure 1 shows the sampling process in detail. The interview took place face-to-face with a questionnaire modified by expert discussions in preliminary surveys, and 1508 valid questionnaires were finally collected, with a response rate of 98.24% ($=1508/1535 \times 100\%$).

The structured questionnaire collected information about: (1) sociodemographic characteristics, such as gender, age, residence (migrants/nonmigrants and urban/rural), marital status, education, employment status, health insurance status (basic and commercial health insurance), individual monthly income, chronic disease condition and self-reported health status; (2) healthcare utilization, including residents' choice of healthcare providers (primary health care facilities or hospitals), the number of monthly primary care visits, the number of annual hospital admissions, and the number of annual referrals; and (3) family physician contract status, i.e., whether the resident has contracted with a family physician team. This study was approved by the Peking University Institutional Review Board (IRB00001052-19072).

2.2. Measures. The main predictor variable in this study was residents' family physician contract status, and it took a value of 1 for contracted status and 0 for noncontracted status. The primary outcome of this study was the healthcare utilization of community residents, including the number of monthly primary care visits, the number of hospital admissions, and the number of annual referrals of community residents, as well as their choice of healthcare facilities after illness.

Based on Anderson's model [23, 42] and past empirical research [24, 43–45], we controlled for a number of potential confounding variables, which were divided into four groups:

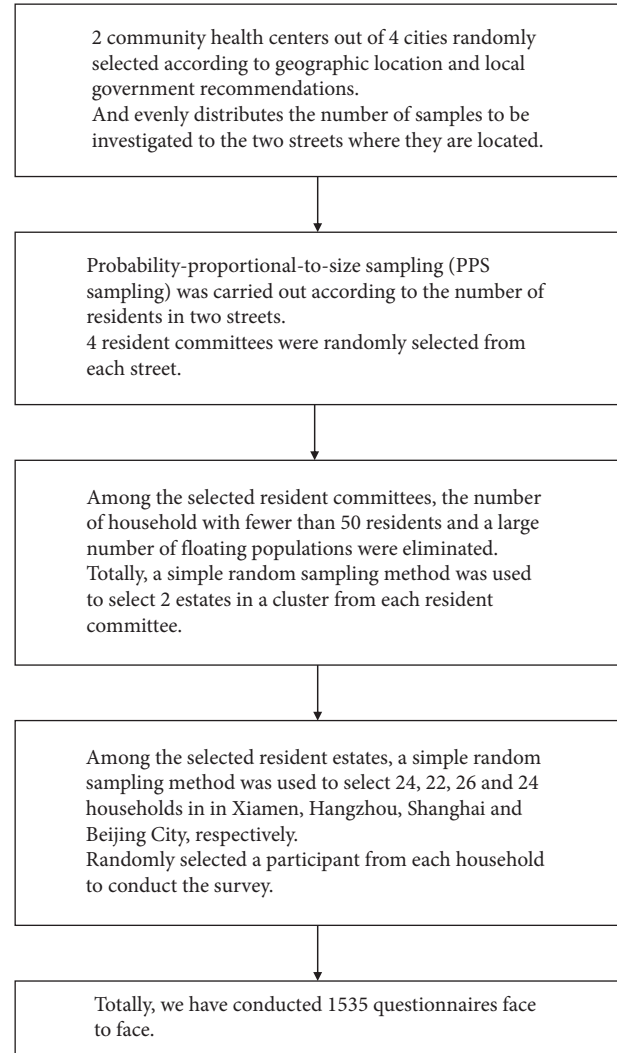


FIGURE 1: Flowchart of the sampling process.

(1) predisposing factors (gender, age, residence, marital status, education, and employment status); (2) enabling factors (health insurance status and individual monthly income); (3) health need (chronic disease condition and self-reported health condition); and (4) location (city).

2.3. Statistical Analyses. We first provided descriptive statistics (e.g., frequencies, means, and medians) for all variables. The differences in healthcare utilization between participants who had contracted a family physician and those who had not were analyzed by the chi-squared test, t -test, and Wilcoxon test.

Regression analyses were conducted to assess the associations between family physician contract service and healthcare utilization of community residents. For count data like the number of monthly primary care visits, the number of annual hospital admissions, and the number of annual referrals, the commonly used econometric analysis model is Poisson regression, with the premise that the expectation and variance of the Poisson distribution must be equal. If the variance of the explained variable is

significantly larger than the expectation, there is over-dispersion and the negative binomial regression should be applied. In this study, given the large number of zeros in the counts of monthly primary care visits, annual hospital admissions, and annual referrals, a zero-inflated negative binomial regression should be considered. Based on the results of tests, the zero-inflated negative binomial regression was used to examine the association of family physician contract service with the number of monthly primary care visits and the number of annual hospital admissions. As for the relationship of family physician contract service with the number of annual referrals, the standard negative binomial regression was used. For zero-inflated negative binomial regression and standard negative binomial regression, outcomes derived from the adjusted models are presented, including incident rate ratio (IRR) and 95% confidence intervals (CI). For the choice of healthcare providers, logistic regression was applied to this binary dependent variable. The results for logistic regression are also reported from adjusted models, including odds ratio (OR), standard error (SE), p values and 95% CI.

In addition, sensitivity analyses were conducted to examine the robustness of our findings. First, the sample of this study was collected from four cities, and a city-level factor could be associated with the healthcare utilization of residents. To address this concern, we employed a multilevel mixed-effects negative binomial and logistic regression model to cluster the errors at the city level. Second, the propensity score matching (PSM) method was therefore used to reduce the bias caused by confounding factors, and a logit model was adopted to estimate the propensity score [46]. Variables included in the PSM model were age, gender, residence, marital status, education, health insurance, employment status, monthly income, chronic diseases condition, and self-reported health status. Then, noncontracted residents were matched with a group of contracted residents based on the probability and propensity scores. PSM estimated the average treatment effect on those treated (ATT), which was the effect of family physician contract service among contracted residents. This approach allows for an estimation of the ATT, which corresponds to the mean difference in outcomes across two groups, and the confidence interval is calculated using an estimate of the standard error. The healthcare utilization indicators were regarded as continuous variables in the PSM analysis. Third, due to the large rural-to-urban migrant population in urban China, we conducted the subgroup analysis to explore the potential differences in the family physician contract services policy and the healthcare utilization for native and migrant residents. All analyses were conducted using Stata Statistical Software, release version 16.0 (Stata Corp. College Station, TX, USA).

3. Results

3.1. Demographic and Socioeconomic Characteristics of Participants. Table 1 shows the demographic and socioeconomic characteristics of participants. A total of 1508 community residents were surveyed, of whom 406 (26.9%)

were located in Xiamen, 344 (22.8%) in Hangzhou, 408 (27.1%) in Shanghai, and 350 (23.2%) in Beijing. Of all the participants, 33.8% were male, and 83.7% were married. The mean age was 58.0 years, and residents who had contracted with a family physician were older than those without a family physician (64.7 vs. 50.0, $p < 0.001$). Nearly 20% were migrants, and more than 95% of residents contracted with a family physician were not migrants. About half of the participants had only finished junior high or high school education. More than half were retired, and a higher proportion of contracted residents were retired than noncontracted residents ($p < 0.001$). The proportion of participants covered by the Urban Employee Basic Medical Insurance (UEBMI) was 55.2%, and most residents did not have commercial medical insurance (78.1%). Residents with an average monthly income of less than CNY 3000 accounted for 31.4%, CNY 3000–5000 accounted for 41.4%, and CNY 5000 or above accounted for 27.3%. A total of 51.5% rated their health condition as good or very good, and nearly 50% had chronic diseases. A larger proportion of contracted residents reported poor or very poor health and chronic diseases compared to noncontracted residents.

3.2. Difference in Healthcare Utilization between Contracted and Noncontracted Residents. Table 2 depicts the differences in healthcare utilization between residents who had contracted a family physician and those who had not contracted. The proportion of first-contact visits to primary care facilities after illness was higher among contracted residents than noncontracted participants (81.2% vs. 59.4%, $P < 0.001$). Compared with the noncontracted, the number of monthly primary care visits was also higher for contracted residents (3.1 vs. 1.9, $P < 0.001$). The annual hospital admission rate for contracted residents was slightly higher than that of noncontracted residents, but among inpatients, the number of hospital admissions was lower for contracted patients. However, neither was statistically significant. The annual referral rate for contracted residents was higher than that of noncontracted residents (10.0% vs. 2.8%), and among referred patients, the number of annual referrals was slightly higher among contracted participants than noncontracted participants (2.1 vs. 2.0), with statistical significance.

3.3. The Associations between Family Physician Contract Service and Healthcare Utilization of Community Residents. Table 3 presents the associations between family physician contract service and healthcare utilization of community residents, including the number of monthly primary care visits, annual hospital admissions, and annual referrals. After controlling age, gender, residence, marital status, education, health insurance status, employment status, monthly income, chronic disease condition, and self-reported health status, it was revealed that the number of monthly primary care visits increased by 151% for contracted residents compared to noncontracted residents after controlling for other confounding factors (IRR = 2.51, 95% CI = 1.60–3.96). In addition, the number of monthly primary care visits for residents in Beijing was 65% lower than that

TABLE 1: Descriptive statistics for overall study population.

Variables	Total	Contracted	Noncontracted	P value
City (%)				<0.001
Xiamen	406 (26.92)	208 (25.27)	198 (28.91)	
Hangzhou	344 (22.81)	151 (18.35)	193 (28.18)	
Shanghai	408 (27.06)	239 (29.04)	169 (24.67)	
Beijing	350 (23.21)	225 (27.34)	125 (18.25)	
Male (%)	510 (33.82)	272 (33.05)	238 (34.74)	0.49
Age (mean \pm SD)	57.99 \pm 17.17	64.68 \pm 13.54	49.95 \pm 17.62	<0.001
Nonmigrants (%)	1205 (79.91)	790 (95.99)	415 (60.58)	<0.001
Living in urban areas (%)	1148 (76.13)	734 (89.19)	414 (60.44)	<0.001
Married (%)	1262 (83.69)	683 (82.99)	579 (84.53)	0.42
Education				0.01
Primary school and below	301 (19.96)	180 (21.87)	121 (17.66)	
Middle school	423 (28.05)	235 (28.55)	188 (27.45)	
High school	387 (25.66)	216 (26.25)	171 (24.96)	
Two-/three-year college/associate degree	188 (12.47)	82 (9.96)	106 (15.47)	
Bachelor's degree and above	209 (13.86)	110 (13.37)	99 (14.45)	
Employment status				<0.001
Employed	436 (28.91)	119 (14.46)	317 (46.28)	
Retired	895 (59.35)	626 (76.06)	269 (39.27)	
Unemployed or at school	177 (11.74)	78 (9.48)	99 (14.45)	
Basic health insurance				<0.001
UEBMI	832 (55.17)	485 (58.93)	347 (50.66)	
URRBMI	559 (37.07)	252 (30.62)	307 (44.82)	
Government medical insurance (gong-fei)	117 (7.76)	86 (10.45)	31 (4.53)	
Having commercial health insurance	331 (21.95)	153 (18.59)	178 (25.99)	0.001
Individual monthly income, CNY				<0.001
<3000	473 (31.37)	253 (30.74)	220 (32.12)	
3000~5000	624 (41.38)	373 (45.32)	251 (36.64)	
5000~8000	274 (18.17)	145 (17.62)	129 (18.83)	
>8000	137 (9.08)	52 (6.32)	85 (12.41)	
Having chronic diseases (%)	751 (49.80)	547 (66.46)	204 (29.78)	<0.001
Self-reported health status (%)				<0.001
Good or very good	777 (51.53)	354 (43.01)	423 (61.75)	
Fair	508 (33.69)	310 (37.67)	198 (28.91)	
Poor or very poor	223 (14.79)	159 (19.32)	64 (9.34)	
N	1508 (100.00)	823 (54.58)	685 (45.42)	

Note. UEBMI, urban employee basic medical insurance; URRBMI, urban and rural resident basic medical insurance.

TABLE 2: Healthcare utilization of community residents with different contracting status.

Healthcare utilization	Contracted	Noncontracted	χ^2/Z value	P value
Proportion of primary care visits (%)	81.16	59.40	19.30	<0.001
Number of monthly primary care visits	3.05	1.87	-5.05	<0.001
Annual hospitalization rate (%)	14.22	12.26	1.24	0.27
Number of annual hospital admissions	1.34	1.90	-1.21	0.23
Annual referral rate (%)	9.96	2.77	30.93	<0.001
Number of annual referrals	2.12	1.95	-5.58	<0.001

for residents in Xiamen (IRR = 0.35, 95% CI = 0.21, 0.59). In terms of individual predisposing characteristics, a 35% decrease in the number of visits was observed for males compared to females (IRR = 0.65, 95% CI = 0.43, 0.97), as well as a large increase for retired or nonworking residents compared to employed residents (IRR = 2.15, 95% CI = 1.05–4.39; IRR = 3.39, 95% CI = 1.60–7.17, respectively). In terms of enabling resources, the number of monthly visits increased significantly for residents as the monthly income increased. In terms of health needs, residents who rated

themselves as having poorer health status had 70% more monthly visits than those who rated themselves as having good or very good health status (IRR = 1.70, 95% CI = 1.17–2.48). We also displayed the regression results using Poisson regression, in which contracted residents consistently had more monthly primary care visits compared with their noncontracted counterparts (see Table S1).

For the number of annual hospital admissions, contract status was not a significant influencing factor. In Beijing, the number of annual hospital admissions decreased by 49%

TABLE 3: The associations of family physician contract service with community residents' primary healthcare visits, hospital admissions, and referrals.

Variables	Number of monthly primary care visits IRR (95% CI)	Number of annual hospital admissions IRR (95% CI)	Number of annual referrals IRR (95% CI)
Contracted with a family physician (vs. noncontracted)	2.51*** (1.60, 3.96)	0.90 (0.64, 1.25)	2.13** (1.07, 4.21)
City (vs. Xiamen)			
Hangzhou	0.91 (0.55, 1.50)	0.66* (0.42, 1.04)	0.31** (0.12, 0.82)
Shanghai	1.38 (0.91, 2.09)	0.86 (0.55, 1.34)	2.69*** (1.28, 5.65)
Beijing	0.35*** (0.21, 0.59)	0.51*** (0.31, 0.84)	3.11*** (1.54, 6.27)
Age	1.00 (0.98, 1.01)	0.99 (0.98, 1.00)	1.00 (0.97, 1.02)
Male (vs. female)	0.65** (0.43, 0.97)	1.33* (0.99, 1.80)	2.11*** (1.32, 3.37)
Nonmigrants (vs. migrants)	0.93 (0.52, 1.65)	0.9 (0.54, 1.48)	3.70** (1.36, 10.05)
Living in urban areas (vs. rural)	0.55* (0.30, 1.03)	0.8 (0.50, 1.28)	0.86 (0.32, 2.30)
Married (vs. unmarried)	0.74* (0.53, 1.03)	0.8 (0.56, 1.13)	0.65 (0.36, 1.17)
Education (vs. primary school and below)			
Middle school	1.03 (0.69, 1.52)	0.66** (0.44, 0.99)	0.97 (0.45, 2.10)
High school	0.82 (0.52, 1.28)	0.56** (0.35, 0.89)	0.69 (0.29, 1.66)
Two-/three-year college/associate degree	0.57 (0.27, 1.22)	0.55** (0.31, 0.98)	0.99 (0.38, 2.58)
Bachelor's degree and above	0.9 (0.46, 1.77)	0.66 (0.36, 1.23)	0.71 (0.26, 1.93)
Basic health insurance (vs. UEBMI)			
URRBMI	1.04 (0.74, 1.46)	0.88 (0.61, 1.27)	1.09 (0.59, 2.02)
Government medical insurance (gong-fei)	1.21 (0.48, 3.03)	1.67* (0.93, 3.01)	2.92*** (1.43, 5.95)
Having commercial health insurance (vs. no)	1.49 (0.91, 2.43)	1.17 (0.80, 1.71)	1.84** (1.06, 3.18)
Employment status (vs. employed)			
Retired	2.15** (1.05, 4.39)	1.44 (0.82, 2.51)	0.49 (0.21, 1.14)
Unemployed or at school	3.39*** (1.60, 7.17)	1.5 (0.81, 2.76)	1.12* (0.46, 2.73)
Individual monthly income, CNY (vs. <=3000)			
3000–5000	1.82*** (1.17, 2.82)	0.83 (0.53, 1.29)	0.35*** (0.18, 0.65)
5000–8000	2.28** (1.18, 4.38)	0.99 (0.57, 1.71)	0.49* (0.22, 1.09)
>8000	1.62 (0.50, 5.22)	0.41* (0.17, 1.01)	0.59 (0.20, 1.72)
Having chronic diseases (vs. no)	0.86 (0.57, 1.29)	1.54* (1.04, 2.27)	1.33 (0.73, 2.42)
Self-reported health status (control group = good or very good)			
Fair	0.88 (0.61, 1.26)	1.15 (0.81, 1.64)	2.42*** (1.49, 3.92)
Poor or very poor	1.70*** (1.17, 2.48)	2.98*** (2.03, 4.39)	3.11*** (1.68, 5.77)
Constant term	2.76*** (1.50, 4.02)	0.22 (-0.31, 0.75)	0.02*** (0.003, 0.14)

Note. UEBMI, urban employee basic medical insurance; URRBMI, urban and rural resident basic medical insurance. ****p* value <0.01, ***p* value <0.05, **p* value <0.1.

compared to Xiamen (IRR = 0.51, 95% CI = 0.31–0.84). Higher education levels were associated with fewer annual hospitalizations. Having chronic diseases would increase the number of hospitalizations by 54% (IRR = 1.54, 95% CI = 1.04–2.27), and participants perceiving themselves with poorer health status were admitted to hospital nearly 200% more frequently than those with better self-reported health status (IRR = 2.98, 95% CI = 2.03–4.39). Similarly, in the alternative Poisson model, no significant association was observed between contract status and the number of annual hospital admissions (see Table S1).

For the number of annual referrals, the results indicated that contracted residents had more annual referrals than the noncontracted (IRR = 2.13, 95% CI = 1.07–4.21). Compared with residents in Xiamen, Hangzhou citizens had decreased number of referrals, while those living in Shanghai and Beijing had more referrals. Males had 111% more referrals than females (IRR = 3.11, 95% CI = 1.54–6.27), and the nonmigrants were more likely to have referrals (IRR = 3.70, 95% CI = 1.36–10.05). The number of annual referrals was 192% higher for those with government medical insurance (gong-fei) compared to those with UEBMI (IRR = 2.92, 95%

CI = 1.43–5.95), and 84% higher for those with commercial medical insurance compared to those without it (IRR = 1.84, 95% CI = 1.06–3.18). Higher average monthly income was associated with a lower number of referrals. Residents with fair or poor self-assessed health status had more annual referrals, respectively, than those with better health status (IRR = 2.42, 95% CI = 1.49–3.92; IRR = 3.11, 95% CI = 1.68–5.77, respectively). In the alternative count model, contracted residents also had more annual referrals than their noncontracted counterparts (see Table S1).

The results of the logit model are shown in Table 4. It was found that participants who had contracted with a family physician were more likely to choose a primary health care facility after illness than noncontracted residents (OR = 3.12, 95% CI = 1.51–6.44). Furthermore, urban residents had a higher probability of choosing primary health care providers as the first point of contact than rural residents, and retired citizens were more likely to choose higher-level health care providers than the employed. Residents with poorer self-assessed health status were 98% more likely to choose a primary care facility than those who reported better health status.

TABLE 4: The association of family physician contract service with the probability of choosing primary healthcare facilities after illnesses.

Variables	OR	SE	<i>p</i> value	95% CI
Contracted with a family physician (vs. did not contracted)	3.12***	1.15	0.002	(1.51, 6.44)
City (vs. Xiamen)				
Hangzhou	1.14	0.59	0.807	(0.41, 3.15)
Shanghai	2.22	1.08	0.102	(0.85, 5.78)
Beijing	0.72	0.37	0.526	(0.27, 1.97)
Age	1.02	0.02	0.265	(0.99, 1.06)
Male (vs. female)	0.72	0.24	0.316	(0.38, 1.37)
Nonmigrants (vs. migrants)	1.48	0.65	0.374	(0.63, 3.48)
Living in urban areas (vs. rural)	2.55*	1.31	0.069	(0.93, 7.00)
Married (vs. unmarried)	0.70	0.27	0.353	(0.33, 1.49)
Education (vs. primary and below)				
Middle school	1.28	0.59	0.593	(0.52, 3.18)
High school	0.95	0.46	0.920	(0.37, 2.48)
Two-/three-year college/associate degree	1.12	0.71	0.861	(0.32, 3.89)
Bachelor degree and above	0.88	0.60	0.855	(0.23, 3.36)
Basic health insurance (vs. UEBMI)				
URRBMI	1.66	0.61	0.164	(0.81, 3.39)
Government medical insurance (gong-fei)	0.40	0.23	0.115	(0.13, 1.25)
Having commercial insurance (vs. no)	0.67	0.26	0.305	(0.32, 1.43)
Employment status (vs. employed)				
Retired	0.35*	0.22	0.098	(0.10, 1.21)
Unemployed or at school	0.59	0.39	0.417	(0.16, 2.13)
Individual monthly income, CNY (vs. <=3000)				
3000–5000	1.28	0.59	0.600	(0.51, 3.18)
5000–8000	1.46	0.90	0.538	(0.44, 4.87)
>8000	0.85	0.70	0.844	(0.17, 4.27)
Having chronic disease (vs. no)	0.72	0.29	0.420	(0.33, 1.59)
Self-reported health status (control group = good or very good)				
Fair	1.55	0.51	0.182	(0.82, 2.93)
Poor or very poor	1.98*	0.81	0.095	(0.89, 4.39)
Constant term	0.25	0.28	0.221	(0.03, 2.32)

Note. UEBMI, urban employee basic medical insurance; URRBMI, urban and rural resident basic medical insurance. *** *p* value <0.01 and * *p* value <0.1.

The multilevel mixed-effects negative binomial and logistic regression model also showed the robust and similar results (see Table S2). Specifically, residents who contracted with a family physician were more likely to utilize primary health care services and referrals. The subgroup analysis revealed that contracted native residents had a significantly higher number of monthly primary care visits and annual referrals compared to their noncontracted counterparts. However, no significant association was found between family physician contract services and healthcare utilization for migrant residents (see Table S3).

3.4. The Associations of Family Physician Contract Service with Healthcare Utilization of Community Residents after PSM. Table 5 shows the ATT for contracted participants' healthcare utilization after PSM. Table S4 illustrates the PSM results using the logit model, and we found a decrease in the standardized % bias of almost all covariates after matching (see Figure S1). In addition, the majority of observations were on support in our analysis (see Figure S2), so only a few samples would be lost when matching. As shown in Table 5, after matching, the number of monthly primary care visits and annual referrals significantly increased, so did the probability of choosing

primary health care institutions after illnesses. In addition, there was no significant change in the number of annual hospital admissions after matching.

4. Discussion

PHC providers are in a central position to coordinate the healthcare needs of community residents, and family physician was regarded as a "gatekeeper" in many health systems. Gatekeeping implies that PHC acts as a filter or device where individuals with a wide range of health problems are required to visit primary care facilities as the first point of contact for their nonemergency health care needs and are then diagnosed and/or treated in a primary care setting and/or referred to more expensive specialist care if necessary. However, no gatekeeping system was available in China. In order to establish the system, the government has introduced the family physician contract service system since 2016 to take the initiative [18], while this policy is still in an early stage and its potential has yet to be realized [20]. This study explored the implementation of family physician contract service in four advanced and representative cities in China, with a special focus on residents' healthcare utilization. It was found that upon contracting a family physician, the probability of choosing primary care for initial consultation after illness, the use of primary care facilities,

TABLE 5: The associations of family physician contract service with healthcare utilization using different matching methods.

Healthcare utilization	Matching methods	ATT	SE	T value
Number of monthly primary care visits	One-to-one matching	0.38***	0.08	4.78
	4-nearest neighbors matching	0.37***	0.08	4.88
	Kernel matching	0.35***	0.08	4.76
Number of annual hospital admissions	One-to-one matching	0.03	0.04	0.74
	4-nearest neighbors matching	0.01	0.03	0.15
	Kernel matching	-0.001	0.03	-0.04
Number of annual referrals	One-to-one matching	0.17***	0.04	4.10
	4-nearest neighbors matching	0.16***	0.05	2.97
	Kernel matching	0.15***	0.05	3.16
Probability of choosing primary healthcare institutions after illnesses, %	One-to-one matching	22.00**	0.09	2.51
	4-nearest neighbors matching	27.62***	0.07	3.75
	Kernel matching	25.88***	0.07	3.66

Note. *** p value <0.01 and ** p value <0.05.

and the occurrence of referrals had increased. This indicated that the family contract service system was positively associated with the establishment of the tired healthcare system and gatekeeping system in China.

This study demonstrated that, compared with non-contracted residents, contracted patients had a higher probability to utilize primary care facilities. A study in Shenzhen, China, also supported our results and also reported that residents who signed service contracts with family physicians were more likely to choose primary care facilities as their first choice of health care institutions compared to those who did not contract with family physicians [34]. The special and critical features of PHC are widely acknowledged to include first-contact access and use of primary care facilities and practitioners; person-centered (rather than disease-focused) care over time; the comprehensiveness of services available and provided within primary care; and coordination of services when they are needed elsewhere [6]. The promotion of PHC by family physician contract service could lead to a more efficient distribution of health care resources since patients would visit their family physicians instead of flooding into tertiary hospitals to receive treatments. If all patients, especially those suffering from common diseases, prefer hospitals than primary care facilities for higher-quality of treatments, the hospitals would be overcrowded while PHC would be left underutilized, resulting in an uneven distribution of resources. The family physician contract system could match supply with demand and increase the proportion of primary health care in the overall health care delivery. The development of PHC allows for a more efficient healthcare system, reducing health inequalities and lowering health costs [47]. For the individuals, better primary healthcare would help increase service quality and was associated with better health outcomes [48].

The main mechanism by which family physician contracts has increased residents' use of primary healthcare may arise from the close interactions between patients and family physicians. Services provided by contracted family physicians showed better first contact access, continuity, comprehensiveness, and coordination, and patients reported higher satisfaction with their experience of care [49].

Moreover, continuity of care was an important factor in fostering the patient-physician relationship [50]. The contracted family physician system not only increased the utilization of primary care for patients with chronic disease but also promoted the overall completion of China's tiered healthcare system in the long run [36, 51]. Family physician contract service allows for a long term and stable relationship between family physicians and residents or patients, so as to enhance individuals' trust in the quality of primary care. In addition, the lower price, closer distance, greater convenience of appointments, and shorter waiting time of services provided by family physicians could also be important factors in motivating residents to utilize primary care [52–54]. In addition, residents contracting with family physicians were also more likely to use public health services in primary care facilities [34, 35]. Whereas the characteristics and abilities of family physicians would also influence the choice of primary care facilities, but qualified family physicians only constituted a small proportion, and more than 20% of physicians practicing in primary care facilities were not licensed in China [12, 20]. Therefore, it is essential to enhance the training and education for family physicians and medical students to promote the establishment of the gatekeeping system in China.

In addition, contracting family physicians has shown an association with more referrals in China. The present study demonstrated that contracted residents tend to utilize referral services more frequently, in terms of both referral rates and the number of referrals. There were several reasons contributing to this trend. Firstly, family physician contract services could increase the utilization of PHC, and decrease the number of residents requiring referrals through improving attendance and early identification of diseases. Furthermore, family physician contract service could accelerate the process of upward referrals from PHC by enabling priority appointments with specialists for referred patients [54]. In China, a noteworthy initiative was the introduction of the "specialists, general practitioners and health managers" team-based care model for family physician contract services system [55]. This model formed a collaborative consortium comprising family physicians and hospital specialists, facilitating the upward referral of

patients by family physicians. For residents contracted family physicians, they would benefit from convenient and fast referral channels that enabled priority appointments with specialists at higher-level hospital. In addition, there were some incentives for residents, such as savings on health expenditures due to deductible exemptions in primary care facilities outpatient visits and postreferral re-hospitalizations in Xiamen City. The increase in upward referrals at the primary level underscored the effective gatekeeping role played by family physicians. They could effectively triage patients and refer those who were truly in need to specialist care or higher-level healthcare services. A French study has also found that contracting a family physician and implementing gatekeeping system could reduce the utilization of specialists' services and self-referrals [56]. Research has revealed that referrals from primary care could lead to more appropriate specialist care, ultimately fostering more efficient healthcare systems and yielding improved health outcomes for patients [48, 57]. Nevertheless, it is important to note that the referral rate remains low, and facilitating downward referrals from higher levels of care remains difficult. This issue could be attributed to several factors, including the insufficient capacity of primary care facilities and the absence of reasonable financial incentives to actively involve specialists in the referral process [58]. Therefore, it is imperative to continue strengthening the interactions between family physicians and specialists while concurrently enhancing the capacity and quality of family physician contract services to better enable referrals.

However, no significant difference was observed between contract status and the annual number of hospital admissions among community residents, and findings from Iran also showed no significant decrease in hospital admission rates after the implementation of the family physician plan [59]. Contracting with a family physician might release residents' unmet needs for inpatient services by improving access to healthcare and offset some of the contributions of family physicians in health management. For the same reason, an earlier study in Iran even found that the implementation of a family physician system had led to a significant increase in hospitalization rates [60]. It was speculated that the unmet needs in 2013 were greater than those in 2021, and the increased demands for hospitalization outweighed the reduced demands from improved health in 2013.

The family physician contract service system could be the key to achieving the tiered healthcare system, as it contributes to the implementation of "primary care for first diagnosis" and "two-way referral" in China. The domestic development of the family physician contract service system is still in the initial stage and should become a priority in the transformation of health care delivery mode in China. The Chinese government has made family physician contract service system a cornerstone of the Health China 2030 strategy [17], and this study could serve as a supportive evidence for the policy. With the PSM method to eliminate the influence of other factors and avoid bidirectional causality, the study found that family physician contract service significantly changed residents' healthcare utilization,

especially for primary care visits and referrals, and was conducive to the realization of an efficient tiered healthcare system. Considerable scope exists for future research on healthcare utilization under the family physician contract service system. The impact of different contract service models on healthcare utilization may vary and need further evaluation. Moreover, as residents' contract behavior and healthcare utilization could reflect the quality of health care services, it is possible to evaluate the necessity of including healthcare utilization in the performance appraisal of family physicians [52].

Furthermore, significant differences were observed between the contracted and the noncontracted groups in terms of age, residence, employment status, and health condition. For native residents, contracted residents had more monthly primary care visits and annual referrals compared to noncontracted residents. However, this relationship was not evident among the migrant population. Existing literature from the Western countries has reported lower healthcare utilization among migrants [61, 62], and in China, migrant residents have been shown to have lower healthcare utilization compared to urban native residents [63, 64]. This study also indicated that the implementation of the family physician contract services policy was positively associated with healthcare utilization of native residents, which suggests that the government and health system need to prioritize the migrant population in urban areas when implementing the family physician contract services policy and offer some incentives to encourage primary healthcare facilities and family physicians to contract and provide healthcare services to the immigrant population. Residents who were retired, in poorer health, with better financial and health insurance were better able to utilize health services, indicating that family physician contract services policy could focus on the priority and more needy population, and with an emphasis on quality of service rather than just the number of contracted residents [55].

There are several limitations in this study. First, some self-reported answers may lead to information recall bias, and as a cross-sectional study, causal relationships could not be inferred. Therefore, we use the PSM method to address potential bias of this study. Secondly, the sample contract rate in each rate was different from the population rate. There are two possible reasons. On the one hand, the sample size was calculated based on the population contract rate in each city in 2017 or 2018, and this survey was conducted from July to September, 2019, in four cities, before the four municipal governments could calculate the contract rate for 2019. We did not find contract rate in 2018 on the official websites of Beijing and Shanghai, and then we confirmed with the health departments of the two cities that the contract rates in 2018 and 2017 were almost the same. The reason was the National Health Commission has issued a document to stabilize the contract rate of family physician contract services from 2018 onwards, and shifted the focus of family physician contract services to improving the quality [65]. Therefore, we used the contract rate of Beijing and Shanghai in 2017 to represent that in

2018. On the other hand, we have strictly adopted a multistage cluster random sampling method to obtain the sample, but the random sampling error may have resulted in a difference between the sample contract rate and population contract rate in each city. In addition, some studies indicated that Changning District of Shanghai was one of the first pilot areas in Shanghai and also in China to practice family physician system [7, 66]. Therefore, two community health centers in Shanghai were randomly selected in Changning District. This study used the contract rate of Changning District to calculate the sample size. Thirdly, individuals who choose to contract may be more health-conscious, and have already been utilizing more medical services. However, there was something to concern. Generally, the quality of primary healthcare in China is poorly characterized, and cannot provide high-quality and satisfactory services for residents. This may lead patients to prefer free choice and a continuing relationship with doctors in hospitals rather than family physicians [19]. Furthermore, social health insurance policies still largely provide limited coverage for primary healthcare or outpatient care, through setting low annual caps for total reimbursement. This could result in overuse of hospital services, even for minor health conditions, and have inhibited family physicians from effectively playing the role of gatekeepers (providing first-contact care) [12]. From both practical and theoretical perspective, it has been observed that individuals in China tend to utilize more medical services offered by hospitals rather than utilizing primary care facilities. The findings of this study reveal a positive association between the family physician contract services system and increased utilization of primary care facilities, as indicated by the increase in number of monthly primary care visits and annual referrals for contracted residents rather than a rise in the number of annual hospital admissions. From the methodological perspective, we used the propensity score matching method to address the potential bias and conducted multilevel analyses to cluster the errors at the city level. These results were robust. In addition, the difference between migrants and nonmigrants may be attributed to the sample size. The noncontracted and contracted samples exhibit significant disparities between nonmigrant and migrant populations. Among the noncontracted residents, a substantial number are rural-to-urban migrants, who exhibit lower healthcare utilization compared to the urban native residents [59, 60]. We will design a new survey to minimize the influence of the migrant population. Finally, due to constraints in manpower and time, the sample was only collected in four representative urban areas with a family physician contract service system in China, and the results have not been confirmed in rural residents. The Chinese government has implemented the family physician contract service policy which is still in its early stage, and therefore this study was conducted in four advanced and exemplary cities for the family physician contract services system in China to explore the association between the policy and residents' healthcare utilization.

5. Conclusion

This study revealed that the family physician contract services system was positively associated with the use of primary care facilities and was also related to more referrals in China. It can guide residents to make more rational use of health care services, enabling more effective deployment of limited resources and better maintenance of population health. However, there is still room for assessment in the family physician contract service system, such as the performance of different family physician contract service model, and the effect of family physician contract service on the quality of healthcare services, which requires the attention of researchers and policy-makers.

Data Availability

The data that support the findings of this study are available on request from the first author (email rzjing@ruc.edu.cn).

Additional Points

What Is Known? (i) The development of family physician contract service is a main component of the government's efforts to establish a tiered healthcare system in China. (ii) Most relevant domestic studies have focused on residents' awareness of family physician contract services, willingness to contract, factors influencing the contract decision, and the implementation of family physician contract service system. *What This Paper Adds?* (i) This study explored the performance of family physician contract service in four advanced and representative regions that have implemented the system in China, with a focus on residents' healthcare utilization. (ii) The family physician contract service system exhibited a positive association with increased utilization of primary care facilities and was also related to more referrals in China.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Rize Jing and Hongwei Hu conceptualized the study or designed the study. Rize Jing contributed to data collection. Rize Jing performed data analysis and interpreted the study. Rize Jing and Haonan Zhang drafted the article. Rize Jing and Hongwei Hu contributed to critical revision of the article. Rize Jing, Haonan Zhang, and Hongwei Hu contributed to final approval of the version to be submitted.

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Supplementary Materials

Table S1: the associations of family physician contract service with residents' healthcare utilization using different models. Table S2: the associations of family physician contract service with residents' healthcare utilization using multilevel mixed-effects regression. Table S3: the associations of family physician contract service with native and migrant residents' healthcare utilization. Table S4: the logit model of propensity score matching between contracted and noncontracted residents. Figure S1: standardized % bias across covariates before and after matching. Figure S2: the common support of the propensity score by one-to-one matching. (*Supplementary Materials*)

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