

Research Article

Understanding the Impact of Community Family Physician Contracting (CFPC) on Community Medical Resources Consumption: A Case Study from Beijing in China

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Object. In order to achieve Healthy China 2030 and an effective and sequential diagnosis and treatment system, family doctor contracting is a crucial strategy for improving graded diagnosis and treatment and achieving universal health. Through the examination of data on community members' medical expenditures, this research investigates the influence of contracting on residents' primary care consultation behavior. **Methods.** Using a quantitative research approach based on information about residents' medical payment patterns, this study aims to examine the effect of family doctor contracting on residents' medical costs. Therefore, a two-part model and a Heckman two-stage model are used to explore the impact of contracting on residents' medical expenses in the community hospital based on the sample of contracted and noncontracted residents and the basic information and monthly checkout data of the residents provided by a community hospital in Beijing. **Conclusion.** Specifically, contracting increased residents' healthcare expenditures in community hospitals by increasing the number of departments and the frequency of visits, according to the results, which indicate that contracting significantly increased residents' healthcare costs in community hospitals. The frequency and number of departments in community hospitals for two target groups—the elderly and patients with chronic diseases—have increased significantly as a result of contracting, according to subgroup analysis. This finding suggests that family physicians make it possible for the daily care and treatment of these two priority groups to be met to a greater extent at the primary level. The empirical findings of this study reveal that the family doctor contracting system has a significant impact on how primary care and hierarchical treatment patterns are established.

1. Introduction

The universal health coverage, accessibility, and affordability of health services global health objective has been established by the World Health Organization (WHO). Health needs have become more complicated and diversified as a result of population aging and changing illness profiles, providing new problems for the medical and health care system. As a reaction, the WHO put out the conceptual framework for an integrated healthcare system that is based on primary healthcare principles [1] and people-centered integrated healthcare (PCIC) [2]. The WHO views primary care and two-way referrals between various levels of health care institutions as the key elements of an effective health service

system, and these frameworks place emphasis on the fundamental role of primary health services in the whole medical and health service system. Family physician contracted to service is the key to the comprehensive establishment of a hierarchical diagnosis and treatment system and the construction of a high-quality, integrated, and effective healthcare service system, according to China's Healthy China 2030 planning outline, which was released in 2016 in response to the WHO's PCIC global strategy [3].

The whole-population and whole-cycle health services provided by the Chinese government place a significant emphasis on the implementation of CFPC. Family doctors serve as the community's health gatekeeper, providing whole-life health management services to people in order to

address the two fundamental goals of equitable access and systematic interconnection of national health services. The implementation of graded diagnosis and treatment has also become a key component of CFPC promotion at the same time. China's family physician contracted service system was officially implemented in 2016 with the release of the guidance on promoting family physician contracted services, and as of now, the 1 + 1 + 1 model in Shanghai, the integrated medical and nursing care model in Hangzhou, the three divisions under the common management model in Xiamen, and the contractual general practitioner team-based service model in Wuhan and Shenzhen are the typical service forms (National Department of Health). The widespread implementation of CFPC in China is still relatively new compared to international practice, the supporting primary care system has not yet been implemented nationwide, and there is still a dearth of empirical evidence on the role of family physicians in the prudent allocation of medical resources despite the fact that the success of these typical models serves as an example of the full-scale rollout of CFPC in China.

Family doctor services are an essential part of basic healthcare and are a widely accepted policy by nations throughout the globe to safeguard citizens' rights to life and health and enhance population quality. They also help patients have a more solid and ongoing relationship with their physicians. More than 60 nations and areas throughout the globe have family doctor contracting services in place as of now. According to empirical data from these nations, people who have signed up for family physician services tend to use healthcare services more frequently and also tend to receive primary care that is of higher quality, especially for patients with chronic illnesses. The contracted group also has significantly higher levels of health and daily care quality than the uncontracted group [4]. In addition, some research studies contend that universal family physician contracting might lessen health disparities in old age brought on by economic differences and assist close the health gap across various socioeconomic groups [5].

There are two major bodies of work that focus on the family physician contractual system and residents' primary care visits in China. The first branch of the research, which is often based on interviews and surveys [6, 7] focuses on the effect of CFPC on residents' willingness and satisfaction with primary care. The second body of research focuses on how the CFPC affects residents' overall medical costs. The majority of studies reveal that contracted residents' medical costs are lower than those of noncontracted residents. Researchers claim that increasing the proportion of primary care visits will reduce contracted residents' medical costs but they do not offer empirical evidence to support these hypotheses. Instead, they rely on data on medical costs to draw their conclusions. The Anderson model, which has been utilized extensively in the study of health care use accessibility [8–11], is a traditional framework for assessing individual health service consumption behavior. Based on the monthly settlement data provided by community hospitals in Beijing, this study uses three dimensions of propensity characteristics, enabling resources,

and medical need to visually analyze the impact of CFPC on the medical expenses of residents in the community hospitals in order to examine the role of CFPC in promoting hierarchical triage and optimizing the allocation of medical resources.

2. Materials and Methods

2.1. Study Design and Data Collection. Using quantitative research techniques and data on real medical payment data for residents given by a community hospital in Beijing, this study aims to evaluate the effect of family doctor contracting on residents' medical costs. Beijing made the following proposal in 2010: "strengthen the service function of primary health care institutions and promote family physician service." With CFPC's ongoing exploration, Beijing's community resident contracting rate has been rising. According to the assessment index of family doctor contracting services in Beijing in 2022, the contracted rate of the city's resident population is anticipated to reach more than 45% at the conclusion of the 14th Five-Year Plan, up from the contracted rate of 35% for residents in the city in 2018. Therefore, it is appropriate to research how the CFPC affects Beijing residents' use of primary healthcare resources. The information used in this research came from a community hospital in Beijing, and it included information on 41 months of resident payments from January 2018 to May 2021 as well as records of every resident's consultations. 5816 patients were eventually included in the sample after removing the consultation records, patients with missing fundamental information such as age and gender, and patients without medical data in one year of the statistical year, and a total of 238,456 valid data were acquired.

2.2. Measures

2.2.1. Dependent Variable. The medical expenditure (ME) of patients at a community hospital in Beijing served as the study's dependent variable. ME was determined by adding up all of the patients' monthly expenses at the specific community hospital from January 2018 to May 2021 who had visit data. Patients lacking medical records for one continuous year were eliminated to further verify data continuity.

2.2.2. Independent Variable. According to the fundamental data provided by community hospitals, the patient's contracted status is the independent variable. Whether the patient is contracted to a family physician is used as the indicator, and the contracted patient is given a value of 1 and the uncontracted patient is given a value of 0.

2.2.3. Control Variables. In this study, Anderson's model is used as the basic framework, and in terms of propensity characteristics, the information of patient's age and gender is mainly referred to; in terms of enabling resources, the sample data mainly involve five types of urban employees' medical insurance, public medical insurance, urban

residents' medical insurance, new rural cooperative, and foreign medical insurance, each of which applies to different reimbursement ratios; patients' need factors are mainly referred to whether they suffer from chronic diseases; meanwhile, this study considers the frequency of visits and the frequency of consultation and the number of departments can be used to measure patients' recognition of the service quality of community hospitals, which is also the environmental factor in Anderson's model, so the frequency of consultation and the number of departments are included in the need dimension. The specific sample selection and assignment are shown in Table 1.

2.3. Statistical Analysis. Medical spending data are a common example of zero-inflated data, which also goes by the name semicontinuous data since there are a lot of zero values and the remaining values follow a continuous distribution. According to Huang and Gan [12], the zero values in the medical cost data may be the result of actual medical costs (i.e., no medical expenditures were spent in the current time) or they may be the consequence of patients' ostensible discontinuation of medical treatment. The data cannot accurately reflect the genuine ME of patients if the zero value occurrence is due to patient self-selection. It also violates the OLS model's premise of the normality of random errors, leading to biased estimators [13].

The two traditional methods for processing semicontinuous data are the two-part model and the Heckman two-stage model. The two traditional methods vary in how null values are handled and the underlying premise assumptions [14, 15]. The two models used in this study's first phase look at whether residents opt to join up for family doctor services, and the second phase looks at the medical expenses recorded after signing up. The two models differ in that they contend that there is no connection between the two stages of the decision-making process and that various mechanisms affect residents' decisions regarding whether to enroll and receive medical care at the community hospital. The Heckman sample selection model, on the other hand, contends that the second component of the medical care

expenditure at the community hospital affects whether or not residents choose to sign up for family doctor services and that whether people sign up or not and medical care expenditure are related. The access choice model may address the self-selection bias issue with the medical cost model since there is a strong association between residents' enrollment decisions and medical expenditures. At the same time, the two models interpret value 0 differently. The Heckman two-stage model contends that value 0 medical costs may be the result of selection bias, whereas the two-part model views value 0 medical costs as the genuine value. The fact that the data in this paper are drawn from a community hospital in Beijing's system billing records helps to some extent ensure the sample's contracting status is distributed randomly (we think this is the case for patients whose visits to the hospital have visit data). To assure the reliability of the regression findings, estimate in this study uses both the two-part model and the Heckman two-stage model. The two-part model below utilizes a generalized linear model (GLM) in the second part to assess individual healthcare costs while the first part uses a probit model to simulate the likelihood that residents would use community hospital health services. In our study, the Heckman two-stage model is applied; first, the Heckman selection model is used to assess whether patients decide to sign a contract or not, and second, the Heckman outcome model is applied to assess the ME suffered by patients who decide to sign a contract and seek treatment in community hospitals. In our research, the statistical analysis was done using Stata16.0.

2.3.1. Two-Part Model. The two-part model in this paper divides patients' medical expenses in community hospitals into two stages. In the first stage, the probit model is used to estimate the probability of patients signing up, i.e., to determine whether the explanatory variable is zero, while the generalized linear model (GLM) is used in the second part to analyze the effect of each characteristic factor on the expenses.

The first part is called the selection model:

$$I_i = 1 (\beta_1 \text{contract}_{it} + \beta_2 \text{gender}_{it} + \beta_3 \text{age}_{it} + \beta_4 \text{chornic}_{it} + \nu_4 \text{times}_{it} + \nu_5 \text{numbers}_{it} + \nu_6 \text{type}_{it} + \varepsilon_{it} > 0), \quad (1)$$

where the random perturbation term ε_{it} obeys the standard normal distribution if the sample has signed $I_i = 1$; otherwise, $I_i = 0$.

The second part is the expenditure model:

$$\text{GLM}(\text{ME}_{it} | I_i = 1) = \beta_1 \text{contract}_{it} + \beta_2 \text{gender}_{it} + \beta_3 \text{age}_{it} + \beta_4 \text{chornic}_{it} + \nu_4 \text{times}_{it} + \nu_5 \text{numbers}_{it} + \nu_6 \text{type}_{it} + \mu_{it}, \quad (2)$$

where the random perturbation term $\varepsilon_{it} \sim N(0, \sigma^2)$, $\text{Cov}(\varepsilon_{it}, \mu_{it}) = 0$. In the two-part model, the zero-valued medical cost data and nonzero are separated and it is assumed that the behavior of patients consuming medical

services, whether they consume or not, is independent of the amount of consumption that occurs. The dependent variable is nonzero medical costs, the explanatory variables are the same as those in the sample selection model, and the main

TABLE 1: Description of relevant variables.

Variables	Description
Dependent variable	
ME (medical expenses)	Total monthly medical expenses by resident
Independent variables	
Analysis variables	
Contract	1 = contracted; 0 = uncontracted
Predisposing characteristics	
Age	Continuous data
Gender	1 = male; 0 = female
Enabling resources	
Type	1 = foreign medical insurance; 2 = new agricultural cooperative; 3 = urban residents' medical insurance; 4 = urban employees' medical insurance; 5 = publicly funded medical treatment (including retired cadres and merit); 1–5 are assigned from the lowest to highest reimbursement ratio
Need factors	
Chronic	1 = chronic disease patients; 0 = nonchronic disease patients
Times	Total number of visits per resident per month
Numbers	Total number of medical departments visits per resident per month

coefficient of interest in this paper is β_1 , i.e., the effect of contracting on patients' health care expenditures in community hospitals.

2.3.2. Heckman Sample Selection Model. The Heckman two-stage model used in this paper, the first stage of which is a choice model, examines the factors influencing patients' choice to contract family physician services.

$$\begin{aligned} \text{contract}_{it} = & \beta_0 + \beta_1 \text{age}_{it} + \beta_2 \text{chronic}_{it} + \beta_3 \text{gender}_{it} \\ & + \beta_4 \text{times}_{it} + \beta_5 \text{numbers}_{it} + \beta_6 \text{type}_{it} + \varepsilon_{it}, \end{aligned} \quad (3)$$

where the explanatory variable contract_{it} is binary variables that take the value of 1 if patient i is contracted in period t and 0 if not contracted. Explanatory variables include the patient's age (age), gender (gender), and other propensity characteristics, as well as indicators in terms of enabling resources health insurance type (type), the number of monthly visits (times), number of monthly visits to departments (numbers), and whether the patient is chronically ill (chronic), and other demand factors. v_t and ε_{it} represent the explanatory variable parameters and error terms, respectively.

The second stage, the scale effect, examines the factors that influence the healthcare expenditures of contracted patients in community hospitals.

$$\begin{aligned} \text{fee}_{it} = & \beta_0 + \beta_1 \text{age}_{it} + \beta_2 \text{chronic}_{it} + \beta_3 \text{male}_{it} + \beta_4 \text{times}_{it} \\ & + \beta_5 \text{numbers}_{it} + \beta_6 \text{type}_{it} + \theta \text{Mills}_{it} + \varepsilon_{it}. \end{aligned} \quad (4)$$

Of these, fee_{it} is the patient's health care expenditure in the community hospital, and Mills_{it} is the inverse Mills ratio obtained from the first-stage model estimation, thus controlling the sample selection bias problem. The reason for the substitution of Mills_{it} is that this indicator contains unobservable information from the first-stage model and helps to correct for possible sample selection bias in the second stage. If the inverse Mills ratio is statistically significant, it

indicates the existence of sample selection bias, and the results of the reference Heckman two-stage model are more reasonable than the results of the traditional OLS regression.

3. Results

3.1. Basic Characteristics of Residences. This study used sample data from patients who had consultation records in community hospitals and had at least one visit per year during the observation period (2018–2021). A total of 5816 patients were eligible for inclusion in the sample, and a total of 238,456 monthly medical resource consumption data for all samples were included. The data source for this paper is a community hospital in Beijing, which covers 13 communities with a total resident population of 33,000. 3,686 of them have contracted, which is a 63.4 percent rate. Table 2 displays the fundamental details of the sample's patients. The sample's patients ranged in age from 56.53 to 19.09 years, with 43.7% being men and a generally equal distribution of the other genders. 42.9% of the sample's patients had chronic conditions, which is consistent with a previous research that found patients who were in poor health and had a regular source of treatment seen more often [16]. The lowest and maximum values of ME, specifically for data on patients' healthcare resource consumption, varied widely, with a standard deviation as high as 817.5, suggesting a wide range in cost per person each visit. The greatest frequency of visits per month was 34, with the number of visits per month varying widely as well.

Table 3 displays the between-group mean test for each variable using the noncontracted patients in the sample as the control group in order to more accurately compare the willingness to use medical resources in community hospitals between patients who have signed up for family physician services and those who have not. The data demonstrate that ME in community hospitals was significantly higher for patients who had signed up than for patients who had not, comparing the basic conditions of the two groups. This finding offers preliminary evidence that the family physician

TABLE 2: Descriptive statistics.

Variables	N	Mean	Standard deviation	Min	Max
Contract	238,456	0.634	0.482	0	1
Gender	238,456	0.437	0.496	0	1
Age	238,456	56.53	19.09	0	98
Chronic	238,169	0.429	0.495	0	1
ME	238,456	571.2	817.5	0	11,807
Times	238,456	1.943	2.571	0	34
Numbers	238,456	0.660	0.648	0	5
Type	238,456	3.839	0.462	1	5

TABLE 3: Between-group mean difference test by sign.

Variables	Uncontracted	Mean	Contracted	Mean	Standard deviation
ME	87330	247.8	151126	758.0	-510.190***
Gender	87330	0.449	151126	0.429	0.019***
Age	87330	50.58	151126	59.97	-9.389***
Times	87330	0.909	151126	2.540	-1.631***
Numbers	87330	0.339	151126	0.846	-0.507***
Chronic	87125	0.258	151044	0.527	-0.269***
Type	87330	1.894	151126	1.117	0.778***

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

contract service can increase residents' willingness to visit primary health services like community hospitals. The average age of both groups was over 50, indicating a higher tendency for the elderly group with the relatively higher frequency of medical visits to seek treatment at the primary level. In contrast, the average age of the contracted group was 59.97, close to 60, indicating a higher willingness to contract among the elderly group. The proportion of chronic disease patients among the contracted residents was 52.7%, which was significantly higher than that of the non-contracted group (25.8%). This finding suggested that family physician contracting increased this group's willingness to use community hospitals' medical resources while also suggesting that chronic disease groups that required regular medical consultation were more responsive to CFPC. The frequency of consultation and the number of departments visited by contracted patients were much greater than those of the noncontracted group, according to statistics on the demand for community medical services of both groups. The frequency of consultation and the number of departments of patients who have signed a contract are much greater than those of patients who have not signed a contract, according to demand statistics for the two categories of community medical services. The difference in community medical service demand between the two groups demonstrates how family physician contract service encourages locals to use more primary healthcare resources. Between the two groups, there were statistically significant variations in the fundamental patient and ME circumstances.

3.2. The Impact of CFPC on the Medical Consumption of Residents. The coefficient of family physician contracting on the cost of patients' visits to community hospitals was significantly positive after controlling for basic patient

characteristics such as age, gender, and the presence of chronic diseases. At the same time, contracting was also positively and statistically related to the frequency of patients' visits to community hospitals and the number of departments visited. This means that CFPC may successfully enhance patient care continuity by contracting with community residents and general practitioners, which not only dramatically increases medical treatment behavior in primary health service institutions but also solidifies the contractual link between community residents and general practitioners. From Table 4, the regression results are in line with other empirical studies that used data from primary health service visits by community members in Beijing. In those studies, family physician services that were contracted had a big impact on how likely residents were to visit community hospitals and how willing they were to make first visits [17, 18].

3.3. The Factors Influencing Residents' ME. The outcomes of the two-part model are used in the second portion of this article to show how much CFPC contributes to residents' ME at community hospitals. By removing the mutual interference between the two-choice processes of family physician contracting and community hospital visits, we will utilize the Heckman two-stage model in this part to further evaluate the variables affecting residents' ME in community hospitals.

Table 5 displays the findings from our first analysis of the variables affecting patients' ME in community hospitals throughout the whole sample. In this research, an OLS regression model and a random effect model regulating the time effect are utilized to examine the explanatory potential and logic of the Heckman two-stage model. The OLS regression results are shown in column (1) of Table 5, the RE regression results controlling the time effect are presented in column (2), and the regression results of the Heckman two-stage model are presented in columns (3) and (4), respectively. The sign and significance of the variables for the OLS regression and random effects model are somewhat different from those of the Heckman two-stage model as can be seen from a comparison of the regression results in columns (1), (2), and (4). The high significance of the inverse Mills ratio further indicates that there is self-selection bias in the sample, and the results with reference to the Heckman model are also somewhat different. The findings of the Heckman two-stage model in columns (3) and (4) provide the major foundation for the discussion that follows.

The Heckman selection model's estimate findings reveal that inhabitants in the sample have different propensity traits, enabling resources, and requirements. Age had a significant positive coefficient, indicating that residents' willingness to participate in CFPC increases with age. This is consistent with the special needs of older adults for continuity of care and continuity of relationship with the doctor as noted in studies [19, 20]. Age and gender both had a significant effect on the choice of CFPC from the perspective of propensity characteristics. In terms of enabling resources, the type of health insurance showed a significantly

TABLE 4: Regression results of the two-part model.

Variable	Part 1 (probit model)		Part 2 (GLM model)	
	Coef.	Robust SE	Coef.	Robust SE
Contract	0.216**	0.10	69.811***	3.99
Gender	0.119	0.08	0.929	3.24
Age	0.005**	0.00	0.738***	0.08
Times	5.139***	0.35	229.199***	1.18
Numbers	1.479***	0.23	9.667	5.94
Chronic	0.329***	0.06	115.412***	3.33
Type	0.251***	0.07	210.070***	5.93
Constant	-5.564***	0.43	-1009.067***	24.84

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 5: Regression results of the Heckman two-stage model.

Variables	OLS	RE	Heckman selection model	Heckman scale model
Contract	29.963*** (13.94)	70.963*** (9.76)		
Gender	228.121*** (191.44)	198.066*** (116.88)	-0.054*** (0.01)	11.818*** (2.87)
Age	6.798*** (3.57)	-2.697 (-0.39)	0.014*** (0.00)	0.031** (0.14)
times	123.521*** (35.66)	114.498*** (24.42)	0.052*** (0.00)	230.782*** (0.77)
Numbers	80.678*** (35.84)	88.886*** (10.98)	0.439*** (0.01)	110.967*** (4.94)
Chronic	0.575*** (10.66)	0.620*** (3.14)	0.327*** (0.01)	72.755*** (3.96)
Type	46.152*** (24.26)	70.372*** (10.61)	0.868*** (0.01)	48.993*** (10.07)
Constant	-454.481*** (-43.78)	-473.099*** (-19.12)	-4.221*** (0.03)	-152.147*** (59.39)
R-squared	0.671			
Mills				-60.282*** (17.95)

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

positive relationship, showing that patients with higher reimbursement ratios are more likely to choose CFPC and are also more likely to make ME after signing a contract. According to the theory, people's desire for health drives their need for medical care, and they tend to base their decision on their chosen degree of health stock on the cost of such services [21]. In addition, the standard medical choice model and the RAND experiment, which contend that patients' willingness to use medical services would rise when the price declines substantially [22], are both consistent with the large impact of out-of-pocket costs on patients' ME. The larger willingness of patients with chronic illnesses to sign up is due to the policies connected to CFPC focusing on patients with chronic diseases, which has a bigger influence on the demand side of the equation [23]. In addition, patients with chronic diseases who need accessibility and continuity of treatment for their own healthcare requirements have shown a propensity to contractualize their ties with doctors in order to strengthen such connections [24]. The findings of current empirical testing are also compatible with the considerably positive chronic illness indicator [25, 26]. Overall, all three

indicators of the demand dimension show a significant positive effect on patients' contracting decisions, indicating that for patients in community hospitals, individual demand for medical services was the main factor examined to measure contracting decisions. The frequency of visits and the number of departments visited are also significantly positive indicators.

In community hospitals, contracted residents' ME per visit tends to rise with age, according to the Heckman scale model, which demonstrates that age has a strong positive effect on this statistic. On the one hand, such older persons have a high frequency of trips to community hospitals and a strong demand for their services, which results in a high ME per visit. On the other hand, it shows that the hardware and medical conditions of neighborhood hospitals can accommodate the everyday healthcare requirements of the elderly, which supports the growth of neighborhood-aged healthcare. The reimbursement ratio of contracted patients plays a significant role in the ME of community hospitals, and the reimbursement ratio of various medical insurance types becomes a crucial factor for beneficiaries seeking

medical services, according to the impact of the type of medical insurance, which is significantly positive. The presence of chronic diseases, the frequency of visits, the number of departments visited, and the need factors all had significantly positive and large coefficients, showing that these factors continue to be important considerations for patients after they have decided whether or not to contract ME.

3.4. Robustness Test. In this study, we mainly adopt the alternative variable method to test the robustness of the aforementioned research conclusions; the mean of the number of quarterly visits and departments per patient is used as a proxy variable for the number of monthly visits and departments; the previous two-part model, the Heckman selection model, and the scale model are reregressed, respectively. The substitution variables are constructed as follows: i represents the resident number i and t represents the t^{th} quarter; the number of visits and the numbers of

TABLE 6: Regression results of the two-part model after substituting the variables.

Variables	Part 1 (probit model)		Part 2 (GLM model)	
	Coef	Robust SE	Coef	Robust SE
Contract	0.126***	0.01	17.414***	4.32
Gender	0.057***	0.01	7.828**	3.58
Age	0.001***	0.00	0.510***	0.09
Times (mean)	0.134***	0.01	245.612***	1.91
Numbers (mean)	3.180***	0.02	-26.366***	7.93
Chronic	0.157***	0.02	85.086***	3.70
Type	0.148***	0.01	153.489***	5.78
Constant	-2.595***	0.04	-555.293***	22.65

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

departments visited by patients in the three months of the t^{th} quarter after the variable substitution was performed were replaced by the mean value.

$$\begin{aligned} \text{averagetimes}_{i,t} &= \frac{(\text{time}_{i,\text{month}1} + \text{time}_{i,\text{month}2} + \text{time}_{i,\text{month}3})}{3}, \\ \text{averagenumbers}_{i,t} &= \frac{(\text{number}_{i,\text{month}1} + \text{number}_{i,\text{month}2} + \text{number}_{i,\text{month}3})}{3}. \end{aligned} \quad (5)$$

Table 6 reports the results of the two-part model regression using the quarterly means of the number of visits and the number of departments visited as proxy variables. Table 7 presents the regression results for the random effects model and the Heckman two-stage model. The results presented in the table indicate that after changing the main variables (times and numbers) to control for basic characteristics such as patients' age and gender, CFPC remains significantly and positively associated with residents' ME in community hospitals at the 1% significance level. Meanwhile, age, chronic, and type (type of health insurance) remained the main factors affecting patients' willingness to contract and interfering with patients' choice of MRC after contracting. In other words, the regression results did not change substantially after the substitution of key variables, indicating that the previous study findings remain robust.

3.5. Endogeneity Test. In addition, this research runs a sensitivity test on the response rate of CFPC in order to take into account the potential for reciprocal causation between the explanatory factors and the explained variables. Contracting behavior in the current era has an effect on the ME in community hospitals in the next period because it influences residents' MRC decisions in the present and their capacity to use primary care resources in the future. As a result, in this section, we examine the relationship between CFPC and ME by substituting the delayed one-period contracting response rate for the current period's contracting status. Based on the OLS model, random effects model, and Heckman two-stage

model, Table 8 shows the link between contracting behavior in the delayed era and ME in the present period. The similarity of the regression results to the benchmark regression structure previously indicated further validates the accuracy of the findings.

4. Discussion

The CFPC realizes the continuity of medical and health services through the long-term contractual relationship between doctors and patients [27], and this efficient two-way information transfer mechanism is conducive to improving the trust of contracted residents in family physicians, thereby promoting primary care and hierarchical triage. The majority of research on CFPC and residents' consultation behavior has been on residents' overall ME and desire to attend primary care. Does hiring family doctors, nevertheless, encourage resident consultation at local hospitals? In addition, in its guidance on family doctor contracting services, the China Health and Wellness Commission identified special populations as key populations, including the elderly and the chronically ill, and emphasized the need to concentrate on standardized management and health services for patients with major chronic diseases (guidance on promoting the high-quality development of family doctor contracting services, 2022). Consequently, this essay will further investigate whether the development of a fixed contract relationship with family physicians improves the daily healthcare and medication collection of important groups such as the elderly (≥ 65 years old) and patients with

TABLE 7: Regression results of the Heckman two-stage model after substituting the variables.

Variables	RE	Heckman selection model	Heckman scale model
Contract	26.513*** (3.72)		
Gender	191.260*** 0.571***	-0.040*** (0.01)	18.167*** (3.44)
Age	4.002 (0.60)	0.014*** (0.00)	2.281*** (0.16)
Times (mean)	236.432*** (29.19)	0.084*** (0.00)	235.372*** (1.19)
Numbers (mean)	75.205*** (9.67)	0.655*** (0.01)	297.212*** (8.43)
Chronic	0.571*** (3.02)	0.285*** (0.01)	106.739*** (4.32)
Type	37.636*** (5.95)	0.754*** (0.01)	176.493*** (10.44)
Constant	-201.900*** (-8.66)	-3.951*** (0.03)	-1123.873*** (63.59)
R-squared	0.547		
Mills			245.422*** (19.76)

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 8: Regression results of the Heckman two-stage model for lagged period data.

Variables	OLS	RE	Heckman selection model	Heckman scale model
Contract (lagged)	26.504*** (12.26)	66.911*** (9.26)		
Gender	231.064*** (190.19)	201.522*** (117.55)	-0.053*** (0.00)	13.168*** (2.90)
Age	7.976*** (4.17)	-1.412 (-0.21)	0.014*** (0.00)	0.090 (0.14)
Times	119.617*** (34.08)	112.102*** (23.61)	0.052*** (0.00)	231.559*** (0.77)
Numbers	74.045*** (32.53)	82.795*** (10.29)	0.453*** (0.01)	105.144*** (5.06)
Chronic	0.566*** (10.41)	0.611*** (3.12)	0.322*** (0.01)	62.517*** (3.96)
Type	37.018*** (19.59)	61.272*** (9.35)	0.857*** (0.01)	29.944*** (10.05)
Constant	-215.272*** (-25.01)	-280.310*** (-11.70)	-4.176*** (0.03)	-39.431*** (59.35)
R-squared	0.678		66.911***	
Mills				-88.384*** (18.04)

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

chronic diseases for these groups in community hospitals. As early as 2010, Beijing, one of the locations in China that had already adopted CFPC, put into practice the family physician contract model that had been tested in Dongcheng, Xicheng, and Fengtai districts [28]. This research conducted an empirical analysis of the effect of contract signing on residents' ME at community hospitals using billing data from community hospitals in Beijing. The findings indicate that compared to the noncontractual population, contracted

residents in community hospitals had MEs that are considerably higher. Efforts should be undertaken to enhance CFPC coverage for important groups and raise the percentage of primary care visits for key populations, according to the guidance on promoting family physician contracted services published in 2016. Is there a difference in ME between the important population in this instance and other groups at community hospitals after the contract was signed?

4.1. Medical Expenses of Community Hospitals for Contracted Residents. The majority of domestic studies support the beneficial impact of contracting on boosting the willingness of key populations to attend primary hospitals with regards to the impact of CFPC on the usage of key populations, such as those with chronic conditions, in primary health care [25, 29]. The following random effects model, which controls for time effects, is used to break down the ME and their influencing factors for various subgroups in the contracted group in order to assess the impact of contracting on the utilization of community hospital services for key populations from the perspective of ME.

Table 9's column (1) displays the relationship between ME for all contracted patients in community hospitals and the three-dimensional variables of forward-leaning factor, enabling resources, and demand; column (2) displays the relationship between ME for the contracted group of the elderly population (65 years and above); and column (3) displays the relationship between ME of the group and the three-dimensional variables of the forward-leaning factor, enabling resources, and demand. The information in column (3) demonstrates the association between the ME of the group of people under 65 and the variables of demand, enabling resources, and forward-leaning factor. The information in column (1) demonstrates that both parameters are strongly and favorably related to ME for the contractual group. The comparison of the data in columns (2) and (3) also reveals that the contracted patients' frequency and number of department visits are significantly higher than those who are younger than 65; thus, the elderly group, which has more health care needs after contracting, is more willing to visit community hospitals than the contracted patients of other age groups. The regression results are in line with empirical findings from prior research using stepwise regression, according to which older patients are much more likely to pick community hospitals for routine medical treatment after enrolling in CFPC [30]. Meanwhile, Liu et al.'s findings that there is a substantial association between ME and the medical insurance reimbursement ratio among the Chinese senior population are in line with the considerably positive coefficient of the type of medical insurance among the people who signed the petition.

In Table 9, column (1) displays the relationship between the three-dimensional variables of the forward-leaning factor, enabling resources, and demand and the ME of all contracted patients in community hospitals; column (4) displays the relationship between the three-dimensional variables of the forward-leaning factor, enabling resources, and demand and the ME of contracted chronic patients; and column (5) displays the relationship between the three-dimensional variables of the forward-leaning factor, enabling resources, and demand. The link between the ME of patients with newly acquired nonchronic diseases and the three dimensions of prospective variables, enabling resources, and demand is shown in column (5). The comparison of the data in columns (4) and (5) further reveals that among contracted residents, patients with chronic diseases attend departments more often and on average more frequently than patients without such conditions. The

empirical findings in Table 9 support Le et al.'s assertion that chronic illnesses would sharply increase the number of visits to the residents.

Table 9's findings show that, on the one hand, elderly and chronically ill patients are more likely to sign up because of their greater reliance on healthcare services and need for continuity of care, and that, on the other hand, the connections made between patients and doctors by CFPC further increase these two groups' willingness to choose community hospitals for consultation, proving that CFPC can successfully promote patient triage, prevention, and treatment. The aforementioned findings demonstrate that the family doctor contract service can assist in achieving "Healthy China 2030"'s primary goals of increasing life expectancy per capita and reducing mortality. It also has a positive impact on solving the health problems of the elderly, chronic disease patients, and other key populations.

4.2. Impact of COVID-19 on the Medical Expenses of Contracted Residents. Family doctors have been crucial in grassroots epidemic prevention and management since the COVID-19 pandemic broke out in 2020. CFPC has been essential in protecting residents' life and health safety and satisfying the population's rising health needs, whether during or after epidemics. In the postepidemic period, regions have successfully pushed the coverage of family physician services and the first consultation at community hospitals in order to guarantee that residents' demands for medical and health services are satisfied and to lower the risk of infections at hospitals.

The visits of contracted residents to community hospitals between January 2018 and December 2019 and January 2020 and May 2021 are shown in Table 10. The visits to community hospitals before and after the outbreak for all contracted residents are shown in columns (1) and (2) of Table 10, whereas the visits for two important populations—the elderly (65 years and older) and patients with chronic diseases—are shown in columns (3)-(4) and (5)-(6). We focused on the frequency () and the number of departments () that residents visited in community hospitals before and during the pandemic to investigate whether CFPC had a role in boosting primary care during epidemic prevention and control. The findings in Table 10 demonstrate that after the epidemic, visits to community hospitals by all contracted residents increased significantly as did the number of departments visited. For the key populations, contracted elderly and chronic patients made more visits to community hospitals after the epidemic, and both the frequency and number of departments visited increased in comparison to the number before the epidemic. According to research on the family physician services offered and residents' readiness to enroll in the postepidemic period in Wenzhou, contracted residents were more likely to seek medical advice from community hospitals after the epidemic [31]. The regression analysis's findings further imply that CFPC helps promote primary care for important groups.

TABLE 9: Influencing factors of medical expenses among the contracted groups.

Variables	Contracted	The old (≥65)	Others (≤65)	Chronic	Nonchronic
Contract	-3.475 (-0.35)	2.821 (0.19)	-8.836 (-0.65)	-0.686 (-0.05)	-4.291 (-0.31)
Gender	0.829*** (3.52)			0.572* (1.76)	1.093*** (3.22)
Age	201.578*** (109.56)	207.688*** (84.44)	194.503*** (71.66)	203.988*** (86.71)	200.181*** (69.70)
Times	118.419*** (22.45)	122.252*** (17.16)	116.795*** (14.92)	139.700*** (19.82)	97.826*** (12.43)
Numbers	86.184*** (8.54)	72.461*** (5.04)	97.957*** (6.89)		
Chronic	88.608*** (6.53)	69.995*** (3.54)	113.022*** (6.03)	38.983** (2.06)	126.057*** (6.54)
Type	-428.612*** (-7.94)	-285.905*** (-3.54)	-495.504*** (-6.83)	-56.780 (-0.71)	-676.879*** (-9.05)
Constant	-3.475 (-0.35)	2.821 (0.19)	-8.836 (-0.65)	-0.686 (-0.05)	-4.291 (-0.31)

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 10: Association between COVID-19 and medical expenses among the contracted groups.

Variables	Before (contracted)	After (contracted)	Before (the old)	After (the old)	Before (chronic)	After (chronic)
Gender	-1.611 (-0.15)	-6.903 (-0.67)	13.479 (0.84)	-12.876 (-0.86)	1.696 (0.11)	-5.197 (-0.35)
Age	1.014*** (3.92)	0.587** (2.42)			0.620* (1.70)	0.510 (1.58)
Chronic	106.775*** (9.50)	57.685*** (5.57)	89.837*** (5.59)	47.612*** (3.24)		
Type	99.556*** (6.84)	75.273*** (5.15)	73.256*** (3.31)	66.625*** (3.47)	40.481* (1.89)	36.418* (1.96)
Times	189.522*** (92.72)	223.013*** (80.82)	198.298*** (70.69)	224.287*** (61.61)	192.462*** (75.02)	223.201*** (59.36)
Numbers	105.224*** (17.87)	121.361*** (15.05)	108.278*** (13.19)	132.620*** (12.37)	121.041*** (15.25)	151.282*** (14.10)
Constant	-442.417*** (-7.63)	-236.148*** (-4.14)	-267.857*** (-2.99)		-15.795 (-0.18)	-60.984 (-0.79)

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.3. Strength and Limitation. The willingness of residents to get into contracts and the effects of contracting on residents' consultation behavior and ME have been the main topics of discussion on CFPC. There is also disagreement about whether the Chinese family physician system may act as a medical cost gatekeeper by directing graded healthcare despite international research, suggesting that family doctors function as both health gatekeepers and medical cost gatekeepers [32]. There is still a relative lack of the pertinent empirical evidence despite the fact that the existing literature generally agrees that the CFPC currently implemented in China reduces overall ME by encouraging contracted populations to seek treatment for minor illnesses and routine care in primary health facilities like community hospitals [33, 34]. Through the use of billing information and patient records provided by community hospitals in Beijing, we examine the relationship between contracting

and patients' ME in this study. We then provide empirical support for the role that family physician contracting has played in the development of a new medical care pattern that places minor illnesses in the community, serious illnesses in the hospital, and recovery in the community. The research also analyzes the contracted group's trips to community hospitals before and after the pandemic and finds that family doctors have a bigger role in encouraging primary care visits during the postepidemic era.

The study shows that the family doctor contracting service system in China significantly contributes to the development of an effective medical service utilization system of "primary care for the first diagnosis" and "two-way referral," and it offers empirical support for continued use of family doctor contracting service as a key strategy to realize "Healthy China 2030." The utilization of family doctor contracted services as a crucial strategy to realize a "Healthy

China 2030” is also supported empirically. Achieving the goal of “Health for All” as outlined in the Alma-Ata Declaration from 1978 will depend on the population’s health quality improving and health disparities between various economic and social groups decreasing as a result of the rise in family doctor contracting rates.

This research has a number of drawbacks as well. Not all of the fundamental features of inhabitants, such as the marital status, education, and self-rated health status, were taken into account in the model due to data availability limitations. Due to the lack of data, it was also unable to examine in this study scientifically whether enrolling in community care would result in fewer visits to other major hospitals and a consequent decrease in the cost of treatment over the course of a patient’s lifetime. Only the monthly visit frequency and the department visited were used in the model to estimate the individual demand for community hospitals since the precise medication usage and treatment plan heavily rely on the residents’ real sickness state and treatment outcomes. To better understand the role, shortcomings in development, and potential future directions of family doctor contracted services in China, we will conduct a more indepth analysis of the health performance of family doctor contracted services in conjunction with data on medical cost settlement in the upcoming study. We will collect as many demographic indicators of the sample as possible through questionnaires and interviews.

5. Conclusion

Our analysis shows that the CFPC in China has successfully improved the frequency and variety of departments that contracted residents visit in community hospitals, hence raising the residents’ ME in these facilities. For some groups (elderly and patients with chronic illnesses), developing a solid connection with a family doctor enables this group of people to develop a habit of initially seeking treatment in the neighborhood, supporting the sensible distribution of medical resources. It is beneficial to encourage residents to join a community hospital primary care model because it helps to establish an effective and organized pattern of healthcare. On the other hand, it also helps to regulate the overall ME and guarantee that residents get timely medical attention. In order to further boost the acceptance and efficient usage of CFPC, we should implement a comprehensive spectrum of policy support measures and improve publicity and education.

Data Availability

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

Disclosure

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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