

Effect of family doctor contract services on patient perceived quality of primary care in Southern China

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Abstract

Background

Family doctor contract service is an important service item in China's primary care reform. This research was designed to evaluate the impact of the provision of family doctor contract services on the patient-perceived quality of primary care, and therefore give evidence-based policy suggestions.

Methods

This cross-sectional study of family doctor contract service policy was conducted in three pilot cities in the Pearl River Delta, South China, using a multistage stratified sampling method. The adapted Primary Care Assessment Tool-Adult Edition (PCAT-AS) was used to measure the quality of primary care services. Data was collected through face-to-face interviews held from July to November, 2015. Covariate analysis and multivariate Linear Regression were adopted to explore the effect of contract on the quality of primary care by controlling for the socio-demographic status and health care service utilization factors.

Results

A total of 828 valid questionnaires were collected. From the interviewees, 453 patients signed the contract (54.7%) and 375 did not (45.3%). Multivariate linear regression showed that patients who received services from contracted family doctors reported higher scores in dimensions of PCAT total score ($\beta=-8.98$, $P<0.000$), first contact-utilization ($\beta=-0.71$, $P<0.001$), first contact-accessibility ($\beta=-1.49$, $P<0.001$), continuity ($\beta=1.27$, $P<0.001$), coordination (referral) ($\beta=-1.42$, $P<0.001$), comprehensiveness (utilization) ($\beta=-1.70$, $P<0.001$), comprehensiveness (provision) ($\beta=-0.99$, $P<0.001$), family-centeredness ($\beta=-0.52$, $P<0.01$), community orientation ($\beta=-1.78$, $P<0.001$), than those who did not receive contract services after controlling socio-demographic and service utilization factors. There were no statistically significant differences in the dimensions of coordination (information system) ($\beta=-0.25$, $P=0.137$) and culture orientation ($\beta=-0.264$, $P=0.056$), than those who did not receive family doctor contract services.

Conclusions

This study demonstrates that the pilot implementation of family doctor contract services has significantly improved patients' perceived primary care quality in the pilot cities, and could help solve the quality problem of primary care. It needs further promotion across the province.

Background

It has been proven worldwide that a strong primary care delivery system is the foundation and guarantee of an efficient health care system, and an increasing number of countries are taking measures to strengthen their primary care capacity [1, 2]. China's health care system reform of 2009 has given more attention and resources to the primary care system [3, 4]. An essential public health services program for all was implemented at this time. The policy was that all primary care institutions should provide a free essential public health services package for all residents including establishing health records, elderly care, chronic disease follow-ups, and more [5]. However, as the service items were provided by specific provider teams, service provision was inconsistent and information was stored separately in segmented sectors. For example, after nurses had collected information from chronic condition follow-ups, there was no channel for them to transfer the information to clinical physicians. Clinical physicians could

neither access health records, nor use the information to support clinical diagnosis. The separation of medical services and essential public health services hindered the quality of primary care and slowed its development. Some studies pointed out that the fragmented delivery of basic public health services has become a bottleneck in the improvement of quality of primary care in China [6, 7].

Evidence from many countries shows that the contract between physician and patient could improve the quality of primary care, and patients who have their usual source of care from their primary care doctors benefit most in health outcomes[8–9]. Pilot trials implementing family doctor contract services were established in some regions in China in 2013 [10]. This trial was determined to integrate the provision of basic medical services and essential public health services in primary care institutions and provide people-centered care to residents. The family physician teams of general physicians, nurses, and public health doctors, signed contracts with local residents to initiate stable doctor-patient relationships. The teams provide health records, regular physician examinations, health management, common disease treatment services, disease management, follow-ups, and referrals. The provision of family doctor contract services should improve community members' disease prevention, treatment and management. The contract between physician and patient is intended to strengthen the connection and communication between the physician teams and patients and their families, transform the former primary health center-based service relation into a real patient-centered service model, and establish stable physician-patient relationships. The contracted family doctor team, compared with the whole clinic, is seen as a more independent, flexible and loyal unit that could provide more accessible, continuous, coordinated and comprehensive services to their contracted patients. Starfield and Shi thought that the basic functions of primary care -accessibility, comprehensiveness, continuity, and coordination, affect each other and work together, and their synergies form a mechanism for promoting health at the primary level [11]. Accordingly, international society has achieved consensus to evaluate of the quality of primary care from the level of realization of primary care functions [12–14].

The pilot trials were initiated in areas where the primary care system was solid and stable. Guangdong province was chosen, with pilot settings of family doctor contract services in the Pearl River Delta, China's most developed delta, in cities that ranked first in providing qualified primary care services. The services were contracted and provided by physician teams working in Community Health Centers (CHCs) in urban districts and in township hospitals and village clinics (VCs) in rural areas. The physician teams were encouraged to develop the best service delivery that adapts to local circumstances.

A number of research projects have been carried out to evaluate the effect of family doctor-patient contract, but most of them have focused on the comparison of contract and non-contract patients on, for example, blood pressure or blood sugar control, or the corresponding patient satisfaction and treatment compliance [15–17]. There has been little research that has explored the family doctor contract services on the overall quality of primary care[13]. This study evaluates the impact of the provision of family doctor contract services on the patient-perceived quality of primary care in terms of accessibility, comprehensiveness, ongoing care, coordination, to provide evidence to support the policy improvement of the contracted service.

Methods

Study design and sample

This cross-sectional study was conducted in the Pearl River Delta, Guangdong Province, China from July to November 2015. A multi-stage sampling method was used to choose samples. In the first stage, three cities were

randomly chosen to perform the investigation from six pilot study sites that conducted family doctor contract services in the Pearl River Delta: Guangzhou City, Huizhou City and Jiangmen City. In the second stage, four CHCs were randomly chosen from each city's urban districts. Two township hospitals were randomly chosen from each city's rural areas, and then two village clinics were randomly chosen from each township hospital's management areas. Since Guangzhou is the only metropolitan area among the three study sites, eight CHCs, four township hospitals and eight village clinics (VCs) were chosen to keep the sampling rational. In total, sixteen CHCs and sixteen VCs were chosen to conduct the investigation. In the third stage, thirty study participants from sample CHC and VC were selected. 960 patients took part in the investigation, and 828 valid questionnaires were collected. The inclusion criteria were as follows: (1) study participants should be local residents who were over 18; (2) study participants must sign a consent form and be able to understand the content of the questionnaire; (3) study participants must have visited the study sites at least once in the past year. Ethical approval was obtained from the Ethics Committees of Guangzhou Medical University.

This sample size was determined based on findings from existing published literature. Current research shows that a minimum sample size for such an analysis is 800, with a 99% confidence interval and a power of 80%. A minimum sample size of 300 for each setting was considered necessary to conduct the comparative analysis. In this study, the sample size was 828, and the sample size for each group was above 375, which was regarded adequate to provide good statistical power [18–21].

Data Collection

We gave the questionnaire to patients at CHC or VC. The interviewers were bachelor and post-graduate students from Guangzhou Medical University, all trained by a supervisor and considered qualified, in order to guarantee completeness and consistency of the investigation. The face to face interviews were conducted at primary care institutions to ensure the quality of questionnaire, and a gift was given as a token of appreciation for the participation.

Measures

A literature review was done before the adaption of the questionnaire. The questionnaire had three parts - socio-demographic information, state of contract and service utilization, as well as the Adult Short Primary Care Assessment Tool (PCAT-AS).

Due to the current trend of measuring the functions of primary care by using patients' perceptions of quality, this research adopted the internationally reputed assessment tool PCAT-AS as the major part of the questionnaire. PCAT was designed and developed by Dr. Barbara Starfield and Dr. Leiyu Shi in Johns Hopkins University, and has been used in a number of studies in different countries[22–26]. We received consent from JHU to use and adapt the questionnaire. The adapted Chinese version of the PCAT-AS questionnaire has been proven valid and reliable in previous studies [20, 27]. PCAT-AS was made to measure seven core functions of primary care: first-contact, continuity, coordination, comprehensiveness, family-centeredness, community-orientation and culture-orientation. The four-point Likers scale was adopted, with one point representing 'definitely not' four points 'definitely yes', and nine points 'not sure'. Higher scores indicate better patient perception of primary care quality [28].

We used the question "Have you signed a contract with a physician /physician team in CHCs or VCs?" to define the state of contract. 'Yes' would be the contracted and 'no' would be un-contracted. The questionnaire also included

socio-economic information like age, sex, marriage, education, monthly income, and use of health service information like self-assessed health status, satisfaction with services and primary care institutions, chronic conditions, and the percentage of medical care expenditures to total consumption.

Statistical analysis

The questionnaires were double checked immediately after the interviews. Data documentation was done with Epidata 3.1 by two independent students and a cross-check was made after data input. Software 18.0 was used to perform the analysis.

Chi-square tests were conducted to compare the socio-demographic characteristics and health care utilization of participants between the group of contracted service patients and group of un-contracted service patients. Covariate analysis was adopted to compare the PCAT scores of the two groups. Then we compared the adjusted PCAT scores by analysis of covariance between the two groups. Lastly, multivariate linear regression was done to explore the effect of contract on the quality of primary care by controlling for the other influencing factors. In this analysis, the multivariate linear regression was performed by using each dimension as well as PACT total scores as dependent variables, the reception of contract services as independent variable, and the socio-demographic (sex, age, education, marital status, family income) and service utilization factors (self-evaluated physical status, patient satisfaction self-evaluated physical health, patients' satisfaction, proportion of medical expenditure to total family expenditure, chronic conditions) as control variables. Stepwise regression was used with $P < 0.05$ as inclusion criteria, and $P > 0.10$ as exclusion criteria. Multivariate linear regression analysis requires a sample size of more than 20 times the number of independent variables. In this study, the number of independent variables in the multiple linear regression analysis is 10 variables, and the sample size is 828 greater than 200. A p-value < 0.05 was considered statistically significant in the analysis.

Results

A total of 960 patients were approached for study inclusion, 828 patients responded to the questionnaire, and 132 patients did not complete investigation. This response rate was 86.25%. The most common reason for non-response was having no time. Since the questionnaire was collected through face-to-face interviews, the completed questionnaire had almost no missing values. The average age was 61.9. Over 60% of patients were over 60. Of the interviewees, 453 patients had signed the contract (54.7%) and 375 did not (45.3%). There were no significant differences in terms of gender, marital status, self-evaluated physical health and chronic conditions between the two groups ($p > 0.05$). However, significant differences were reported in the dimensions of age, education, family monthly income, patient satisfaction, and proportion of medical expenditure to total family expenditure ($p < 0.05$) (table 1).

Table One: The socio-demographic status and health care service utilization between the contracted and un-contracted patients

Variable	Scales	Total (n = 828)	Contracted (n = 453)	Un- contracted (n = 375)	χ^2	P
Socio-demographic characteristics						
gender	Male	310(37.4)	174(38.4)	136(36.3)	0.403	0.564
	Female	518(62.6)	279(61.6)	239(63.7)		
Age	18–34	55(6.6)	17(3.8)	38(10.1)	38.111	< 0.001
	35–59	237(28.6)	102(22.5)	135(36.0)		
	≥ 60	536(64.7)	334(73.7)	202(53.9)		
Marital status	Yes	150(18.1)	80(17.7)	70(18.7)	0.140	0.718
	No	678(81.9)	373(82.3)	305(81.3)		
Education	Junior high and lower	580 (70.0)	360(79.5)	220(58.7)	42.321	0.000
	Senior high and above	248(30.0)	93(20.5)	155(41.3)		
Family monthly income	≥ 3000 RMB	532(64.3)	320(70.6)	212(56.5)	17.775	0.000
	< 3000 RMB	296(35.7)	133(29.4)	163(43.5)		
Service utilization						
Self-evaluated	Good	283(34.2)	149(32.9)	134(35.7)	0.736	0.418
physical health	Fair and poor	545(65.8)	304(67.1)	241(64.3)	5.279	0.024
		621(75)	354(78.1)	267(71.2)		
Patient satisfaction	Satisfied	621(75)	354(78.1)	267(71.2)	5.279	0.024
Proportion of medical expenditures to total Family expenditures	Unsatisfied	207(25)	99(21.9)	108(28.8)	5.172	0.024
	< 10%	358(43.2)	212(46.8)	146(38.9)		
Chronic conditions	10%–30%	470(56.8)	241(53.2)	229(61.1)	3.274	0.195
	yes	434(52.4)	248(54.7)	186(49.6)		
	no	393(47.5)	205(45.3)	188(50.1)		

Since continuity referral was limited to patients who had been referred to large hospitals, only 45.2% patients who were qualified to answer within this dimension. To avoid possible bias, the calculation of PCAT total score excluded this continuity (referral) dimension. The average of PCAT score was 27.68. Covariate analysis was adopted to

compare the two groups of patients' perceived feeling of the quality of each dimension as well as the PCAT score controlling for the socio-demographic and service utilization factors. The adjusted score of each PCAT dimension were calculated, and P value was offered to show the difference between groups, after controlling for gender, age, marital status, education, family monthly income, self-evaluated physical health, patient satisfaction, proportion of medical expenditure to total family expenditure, and chronic conditions. The patients who received family doctor contract services reported higher scores than those that did not, in the dimensions of total Pact score (28.79 vs26.43;p < 0.001),first contact-utilization(3.40vs3.17;p < 0.001),first contact accessibility(3.00vs2.63;p < 0.001),continuity(3.03 vs2.71;p < 0.001), coordination(referral)(3.17vs2.82,p0.001),comprehensiveness(service utilization)(3.40vs3.06;p < 0.001), and comprehensiveness(service provision)(3.50vs 3.25;p < 0.001);family-centeredness(2.87vs2.69;p < 0.01), community orientation(2.99vs2.40;p < 0.001),No significant difference was found in coordination(information system) and culture orientation between the two groups of patients(Table Two).

Table Two - Primary care quality scores between contracted and un-contracted patients, adjusted

Dimension	Adjusted-mean(95%CI)		D-value (1)-(2)	P
	contracted (1)	Un-contracted (2)		
First contact-utilization	3.40(3.35,3.46)	3.17(3.11,3.23)	0.23	< 0.001
first-contact-accessibility	3.00(2.95,3.07)	2.63(2.56,2.70)	0.37	< 0.001
continuity	3.03(2.97,3.09)	2.71(2.64,2.78)	0.32	< 0.001
coordination (referral)	3.17(3.07,3.28)	2.82(2.70,2.94)	0.35	< 0.001
coordination (information system)	3.32(3.25,3.39)	3.23(3.15,3.31)	0.09	0.137
comprehensiveness (utilization)	3.40(3.35,3.46)	3.06(3.00,3.12)	0.34	< 0.001
comprehensiveness (provision)	3.50(3.43,3.57)	3.25(3.18,3.32)	0.25	< 0.001
family-centeredness	2.87(2.79,2.94)	2.69(2.61,2.78)	0.18	0.003
community orientation	2.99(2.93,3.05)	2.40(2.33,2.47)	0.59	< 0.001
culture orientation	3.26(3.20,3.32)	3.17(3.11,3.24)	0.09	0.056
total score	28.79(28.45,29.14)	26.34(25.96,26.72)	2.45	< 0.001
Notes: Nine dimensions were included to calculate the total score. The dimension of coordination (referral) was excluded as it was only answered by a few patients who received referral services.				

Further analyses were made to explore the effect of the contract on the quality of primary care by controlling for the other influencing factors. The multivariate liner regression results showed that the patients who received contract services reported higher PCAT total scores ($\beta=-8.98$, $P < 0.000$), first contact-utilization($\beta=-0.71$, $P < 0.001$), first contact-accessibility($\beta=-1.49$, $P < 0.001$), continuity($\beta = 1.27$, $P < 0.001$), coordination(referral) ($\beta=-1.42$, < 0.001), comprehensiveness(utilization) ($\beta=-1.70$, $P < 0.001$), comprehensiveness(provision) ($\beta=-0.99$, $P < 0.001$), family-

centeredness($\beta=-0.52$, $P < 0.01$),community orientation($\beta=-1.78$, $P < 0.001$), than those who did not receive contract services after controlling for socio-demographic and service utilization factors. There were no statistically significant differences in the coordination (information system) ($\beta=-0.25$, $P = 0.137$) and culture orientation ($\beta=-0.264$, $P = 0.056$). (Table three). In addition, factors significantly associated with higher PCAT total scores included patient satisfaction and chronic conditions. Patients satisfied with primary care institutions and those with chronic conditions tended to report better primary care experiences.

Table Three - multivariate liner regression of the each dimension and

Pact Total Scores

variable	total score β (95% CI)	first contact- utilization β (95% CI)	first contact- accessibility β (95% CI)	continuity β (95% CI)
Contract				
yes				
no	-8.98(-10.83,-7.13) ***	-0.71(0.96,0.45) ***	-1.49(-1.87,-1.12) ***	-1.27(-1.63,-0.90)***
socio-demographic				
gender				
male(ref)				
female	- .906(-2.76,0.94)	0.03(-0.23,0.28)	-0.44(-0.81,-0.06) *	-0.15(-0.52,0.22)
age				
18–59(ref)				
≥ 60	-1.335(-3.42,0.75)	0.12(-.17,0.40)	-0.40(-0.82,0.03)	-0.41(-0.82,0.01)
Marital status				
Unmarried(ref)				
married	1.31(-.99,3.61)	- .20(0.34,0.29)	0.20(-0.27,0.67)	-0.39(-0.07,0.85)
education				
Junior high and lower(ref)				
Senior high and above	-0.26(-1.38,0.84)	-0.22(-0.37,-0.07)**	-0.18(-0.41,0.04)	-0.24(-0.46,-0.01) *
Family monthly income(¥)				
< 3000(ref)				
≥ 3000	-0.25(-1.24,0.74)	-0.17(-0.31,-0.03) *	-0.32(-0.52,-0.12) **	-0.17(-0.37,-0.03)
Service utilization				
Self-evaluated				
Good(ref)				
Fair and poor	-0.39(-1.37,0.60)	0.04(-0.09,-.18)	-0.07(-0.27,0.13)	0.01(-0.19,0.21)
Patient's satisfaction				
Satisfaction(ref)				
Un-satisfaction	-9.25(-11.30,-7.20) ***	-0.78(-1.06,-0.50) ***	-1.27(-1.70,-0.86) ***	-1.37(-1.78,-0.96) ***

variable	total score β (95% CI)	first contact- utilization β (95% CI)	first contact- accessibility β (95% CI)	continuity β (95% CI)
Proportion of medical expenditures to total family expenditures				
≤ 10%(ref)				
> 10	0.66(-1.21,2.52)	-0.12(-0.38,0.13)	0.37(-0.01,0.75)	0.05(-0.32,0.43)
Chronic conditions				
no(ref)				
Yes	2.53(1.00,4.06) **	0.20(-0.10,-.41)	-0.04(-0.35,0.26)	0.42(0.11,0.72) **

⊠: ***P < 0.001, **P < 0.01, *P < 0.05

Continue Table Three

variable	Coordination (referral) β (95% CI)	Coordination(information system) β (95% CI)	Comprehensiveness (utilization) β (95% CI)	Comprehensiveness (provision) β (95% CI)
Contract				
yes				
no	-1.42(-2.09,-0.74) ***	-0.25(-0.58,-0.08)	-1.70(-2.11,-1.29)***	-0.99(-1.40,-0.60) ***
socio-demographic				
sex				
male(ref)				
female	-0.30(-0.98,0.37)	0.25(-0.08,0.58)	-0.33(-0.73,0.08))	-0.22(-0.62,0.18)
age				
18–59(ref)				
≥ 60	0.26(-0.51,1.04)	-0.08(-0.46,0.29)	-0.08(-0.46,0.29)	0.05(-0.40,0.50)
Marital status				
Unmarried(ref)				
married	-0.20(-0.99,0.59)	0.41(-0.01,0.82)	-0.22(-0.73,0.08)	-0.05(-0.54,0.45)
education				
Junior high and lower(ref)				
Senior high and above	-0.42(-0.82,-0.02)	-0.24(0.04,0.44) **	0.16(-0.09,0.40)	-0.09(-0.33,0.15)
Family monthly income(¥)				
< 3000(ref)				
≥ 3000	-0.05(-0.40,0.30)	0.12(-0.06,-.30)	0.14(-0.08,0.36)	0.14(-0.08,0.35)
Service utilization				
Self-evaluated				
Good(ref)				
Fair and poor	-0.18(-0.18,0.54)	0.01(-0.17,0.18)	-0.09(-0.31,0.13)	-0.15(-1.60,-0.71)
Patient's satisfaction				
Satisfaction(ref)				

variable	Coordination (referral) β (95% CI)	Coordination(information system) β (95% CI)	Comprehensiveness (utilization) β (95% CI)	Comprehensiveness (provision) β (95% CI)
Un-satisfaction	-0.79(-1.53,-0.05)	-0.65(-1.02,-0.28) **	-1.17(-1.62,-0.72) ***	-1.15(-1.60,-0.71) ***
Proportion of medical expenditures to total family expenditures				
≤ 10%(ref)				
> 10	0.03(-0.71,0.76)	0.25(-0.09,0.58)	-0.51(-0.92,-0.10) *	0.21(-0.19,0.61)
Chronic conditions				
no (ref)				
Yes	-0.43(-1.18,0.32)	0.39(0.11,0.66) **	0.53(0.19,0.87) **	0.49(0.16,0.82) **

☒: ***P < 0.001, **P < 0.01, *P < 0.05

Continued Table Three

variable	Family-centeredness β (95% CI)	Community-orientation β (95% CI)	Culture-orientation β (95% CI)
Contract			
yes			
no	-0.52(-0.86,-0.18) **	-1.78(-2.06,-1.49) ***	-0.26(-0.54,0.01)
socio-demographic			
sex			
male(ref)			
female	-0.03(-0.37,-.31)	-0.30(-0.58,-0.01) **	0.28(0.01,0.55)
age			
18–59(ref)			
≥ 60	-0.35(-0.74,0.03)	-0.35(-0.74,0.03)	-0.19(-0.49,-.12)
Marital status			
Unmarried(ref)			
married	0.08(-0.34,0.50)	0.13(-0.23,0.48)	0.40(0.06,0.73) *
education			
Junior high and lower(ref)			
Senior high and above	0.11(-0.09,0.31)	-0.08(-0.25,0.09)	0.04(-0.124,0.20)
Family monthly income(¥)			
< 3000(ref)			
≥ 3000	-0.05(-0.23,-.14)	-0.02(-0.17,0.14)	0.08(-0.07,0.23)
Service utilization			
Self-evaluated			
Good(ref)			
Fair and poor	-0.13(-0.32,-.04)	-0.04(-0.19,-.12)	0.04(-0.11,0.18)
Patient's satisfaction			
Satisfaction(ref)			
Un-satisfaction	-0.93(-1.30,-0.55) ***	-1.16(-1.48,-0.84) ***	-0.77(-1.07,-0.47) ***
Proportion of medical expenditures to total family expenditures			

variable	Family-centeredness β (95% CI)	Community-orientation β (95% CI)	Culture-orientation β (95% CI)
≤ 10%(ref)			
> 10	0.47(0.13,0.81) **	-0.06(-0.35,0.23)	0.01(-0.27,0.28)
Chronic conditions			
no (ref)			
Yes	0.31(0.03,0.59) *	0.04(-0.20,0.27)	0.20(-0.02,0.42)

□:***P < 0.001, **P < 0.01, *P < 0.05

Discussion

This research has explored the association between family doctor contract services and patient perception of primary care quality. The results have shown that the physician/patient contracted service delivery model could significantly improve the quality of primary care. Previous studies have shown that a family doctor contract service has a positive effect on compliance of patients with chronic conditions, enhancing awareness of the family doctor service, establishing stable relationships with family doctors, and improving visiting rates at primary care institutes. [15, 29–30]. Another study found that coordination is the weakest component of the primary care service [31]. In summary, these studies have explored the effects of contracted services on improving the quality of primary care from different aspects.

The contracted service items in Guangdong province included: to create and manage individual health records, to treat common diseases, to give annual health examinations, and conduct proactive life intervention measures to prevent and manage chronic conditions. When the contracted patients had health conditions, their contracted physicians were responsible for offering consultations, and treatment and physical therapies when necessary. When the conditions were more serious, it was also the contracted physician's responsibility to refer the patient to the upper-level hospital and follow up the subsequent treatments. The contracted physicians were also required to offer follow-up services to patients with chronic conditions, regularly update the condition development, and adjust the prescriptions accordingly. In brief, this physician-patient contract policy promoted to reorganize the current fragmented medical care and basic public health service delivery system in primary care facilities, and improve the quality of primary care systems. Better integration of basic public health and medical services in primary care institutions is helpful to improve health outcomes. [6]

This study has shown that patients that received family doctor contract service reported higher scores than those that did not receive the service, in the dimensions of first contact and continuity. This indicates that the physician-patient relationship is strengthened by the service contract. The contracted residents reported a higher rate of choosing primary care institution as the first contact compared with the un-contracted residents. For the contracted physicians the contract enhanced their sense of responsibility to the contracted patients and improved doctor-patient communication. This behavior change in physicians could restore mutual trust, improve patient loyalty and establish long-term relationships. Therefore, more patients would use the contracted physician's office as the usual source of care, so the scores of first contact and continuity dimensions would improve as a consequence[32]. The

ongoing doctor-patient relationship is the core spirit of primary care [32–33]. Through knowing patients' medical history and health status, doctors could offer patients personalized care and could diagnose diseases in the early stages. Patients could show better compliance and efficacy.

In addition, this study has shown that the patients who received family doctor contract service reported higher scores than those did not receive the service, in dimensions of continuity (referral), comprehensiveness, and family-centeredness and community orientation. This is because the contract items required the contracted primary care institutions to provide referral services to contracted patients, which improved referral services. The contract service list also covers essential public health care services and medical services, which has ended the history of fragmented public service delivery system and provided a comprehensive service package, including the establishment of individual health records, common disease treatment, chronic condition follow-up and so on. These public health service items are offered to patients by contracted physicians and their team members, so that mutual connections were strengthened and the contracted patients reported higher score in the dimension of comprehensiveness. With the advance of interpersonal communication, the contracted physicians could learn more about patients' family conditions, community characteristics, and consider these factors when treating patients. As a result, the contract patients' evaluation of the dimensions of family centered-ness, community orientation, was higher than the un-contracted patients.

Analysis of the scores of each dimension showed that patients did not report differences in the dimensions of coordination (information system) and culture orientation. Coordination (information system) means the capacity of connecting all sides of service provision participants as well as the service process [32]. Regardless of the contracted or un-contracted residents, the information is recorded and transferred in the same way, so there is no difference between the both groups in terms of coordination (information) This finding also indicates that more work should be done to improve the information system building and information management. The culture dimension refers to the respect to patients' religion, values or specific behaviors that may influence health outcomes. This is related to the providers but not the contract services.

This research had some limitations. First, this research explored the functional satisfactions offered to contracted residents under the primary care functional theory; however, it may neglect the description of the objective quality improvement brought by contract services. Secondly, there might be bias caused by local residents who refused to be interviewed, but we made good quality control by face-to-face interviews, which could have counteracted the bias. Thirdly, this is a cross-sectional survey which may not have explored causal relationship from these findings.

Conclusions

In conclusion, the implementation of family doctor contract service has generally improved primary care quality, which is worth further promotion provincially or even nationally. This is a cross-sectional study, but longitudinal research should be made accordingly to improve the accuracy of the evaluation and explore the influencing mechanism.

Abbreviations

PCAT-AS

Primary Care Assessment Tool-Adult Edition

PCAT

Primary Care Assessment Tool

CHCs
Community Health Centers
VCs
village clinics

Declarations

Ethics approval and consent: This study was approved by the Ethics Committees of the Guangzhou Medical University (IORG No: IORG20150416). In this face-to-face survey study, all study participants were informed of the purpose of the study and had the right to leave the interview at any time. All study participants were required to give written informed consent before the interview.

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Author's contributions: Conceived and designed the experiments: SSF, AYC, Performed the experiments: SSF, AYC, ZNL, YX, Analyzed the data: SSF, Wrote the article: SSF, LWZ. All authors have read and approved the manuscript.

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Availability of data and materials: The datasets used and analyzed during the current study available from the author on reasonable request (send email to: fengshsh@126.com).

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