

The Quality of Primary Care in Community Health Centers: Comparison among Urban, Suburban and Rural Users in Shanghai, China

Jianwei Shi

Shanghai Jiao Tong University Department of General Practice Shanghai General Practice and Community Health Development Research Center

Hua Jin

Tongji University school of medicine

Leiyu Shi

Johns Hopkins University

Chen Chen

Jing'an District Jiangning Road Community Health Service Center

Xuhua Ge

Tongji University School of Medicine

Yuan Lu

Tongji University School of Medicine

Hanzhi Zhang

Tongji University School of Medicine

Zhaoxin Wang

Shandong Jiaotong University

Dehua Yu (✉ shgprc@yeah.net)

Tongji University School of Medicine

Research article

Keywords: primary care, community health centers, quality, PCAT

Posted Date: June 9th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-28943/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published on August 27th, 2020. See the published version at <https://doi.org/10.1186/s12875-020-01250-6>.

Abstract

Background

Following World Health Organization's initiatives to advance primary care, China put forth forceful policies including the Personal Family Doctor Contract to ensure that every family sign up with a qualified doctor in a community health center (CHC) ever since its 2009 New Health Reform. This study used the Johns Hopkins-designed Primary Care Assessment Tool (PCAT) to assess primary care quality experienced by the contracted residents and compare this across different socioeconomic regions.

Methods

Using a multistage sampling method, four CHCs each were randomly selected from urban, suburban and rural districts of Shanghai, a metropolitan with 24 million residents. ANOVA and Multivariate analyses were used to assess the association between location of CHC and the quality of primary care experience.

Results

A total of 2,404 CHC users completed our survey. Except for the domain of coordination (information systems), users from suburban CHCs reported best primary care experiences in all other domains, followed by users of rural CHCs. After controlling for covariates, suburban CHC users were more likely to report higher total PCAT scores ($\beta=1.57$, $P < 0.001$). The older users, more frequent users, and those in better health condition reported higher PCAT scores.

Conclusions

CHC users generally reported high quality primary care experience especially in the domain of first-contact (utilization), family centeredness, and comprehensiveness (services provided). That suburban and rural CHC residents reported better primary care experience than urban CHCs demonstrates the unique value of CHCs in relatively medical underserved areas.

Background

As proposed by World Health Organization (WHO), primary care is a whole-of-society approach that includes health promotion, disease prevention, treatment and rehabilitation, etc. It addresses the majority of a person's health needs throughout their lifetime, and it is people-centred rather than disease-centred^[1]. A strong focus on primary care contributes to the well-functioning of the health care system overall^[1,2]. Previous studies have reported that sound primary care, is well provided by general practitioners in community health institutions in the United States, England, New Zealand, Spain, Canada, etc.,^[3,4] helping facilitate health care delivery in these countries. By comparison, China's primary care system lagged behind and did not receive enough attention until a big shortage of medical resources occurred and led to a lopsided health care delivery system. In 2009, a new round of healthcare reform was launched nationwide in China, in which the government explicitly set a goal to strengthen primary care^[5]. Under this reform, 2,200 county hospitals and more than 330,000 clinics and rural township hospitals were reconstructed or upgraded into CHCs to ensure that a primary care provider is available to all residents living within a 15-minute transportation radius^[5].

In 2011, a personal family doctor contract policy was instituted nationwide to encourage residents to utilize services provided by CHCs first when seeking out care. Shanghai, as one of the early cities in China to develop CHCs, put forth specific guidelines to implement the contract in providing comprehensive primary care services, including diagnosis and referral services for common diseases, frequently-occurring disease treatment, chronic disease management, public health services, rehabilitation, nursing and other appropriate community-based medical services^[6]. By the end of 2018, there were 6.66 million Shanghai residents (with a sign-up rate of 30%) who participated in the "1 + 1 + 1" (one CHC + one regional secondary hospital + one tertiary hospital) family contract program. The sign-up rate for vulnerable populations such as those 65 and over, pregnant, or disabled, reached 54%. For diabetes and hypertension patients, the rate was over 84%^[7].

Heretofore, except for a few qualitative case studies and commentaries, no systematic research has been conducted to assess how the personal family doctor contract policy fared. Little is known about the primary care quality experienced by CHC users under the family contact system and whether there are variations in quality across different socioeconomic regions. The current study used the primary care assessment tool (PCAT) to examine the quality of primary care experience by CHC users across different socioeconomic regions. Results of the study not only demonstrates the quality of primary care provided by CHCs for their contracted users, but also assesses if there are disparities in primary care performance across different socioeconomic regions. Although carried out in China, our study could have implications for other cities or regions undergoing urbanization and reorganizing healthcare delivery and further advance the role of CHCs as a community-based primary care provider.

The PCAT was designed by the Johns Hopkins Primary Care Policy Center and focuses on four exclusive attributes: first contact, longitudinality, comprehensiveness, and coordination. Three supplemental attributes, family centeredness, community orientation, and cultural competence, are also included^[8]. Initially applied in the US^[8], the PCAT gradually acquired international recognition and has been adapted in other countries with diverse health systems, including Canada^[9], Spain^[10], Brazil^[11], Korea^[12] and China^[13]. The applications represent the level of primary care provided in various regions and countries and can help by providing specific and targeted directions for improvement^[14]. PCAT evaluations have credited the CHC model with providing accessible, cost-

effective, and high quality primary care and reducing health disparities^[15, 16]. Its wide adoption across the world makes it a suitable instrument for assessing the quality of primary care in China.

Methods

Study setting

In this study, we chose Shanghai metropolitan because its primary care system is well-developed and represents one of the best in China. At the end of 2019, Shanghai had a population of 14.50 million registered residents and 9.80 million non-registered residents, and its GDP per capita was the highest in China (113.6 thousand RMB)^[17]. Shanghai is also often the pilot of national healthcare reform and policy implementation. Its advanced urbanization but diverse socioeconomic development make it a generalizable region to assess primary care performance by CHCs across varying socioeconomic regions.

Due to regional differences in economic and healthcare resources, the primary care in CHCs varies vastly among different socioeconomic regions. In urban region, the dense distribution of secondary and tertiary hospitals makes residents less inclined to choose CHCs due to the convenience of accessing higher-level hospitals and the lack of limits on obtaining specialist services^[18]. In suburban region, on the other hand, more new projects are stationed and hence more investments. For example, in the suburban Pudong District of Shanghai, a new health reform initiative was launched in 2014, allowing for construction subsidies and talent recruitment to spur CHC development^[19–21]. In rural region, the average number of GPs at each CHC is significantly lower than in urban and suburban areas^[22–23].

A multistage sampling method was used (Fig. 1). In stage one, we classified all Shanghai CHCs (n = 244) into two groups based on their total quality scores as captured by the 2019 Annual Report of Health Center General Practice Quality Performance^[24] (i.e., those ranked in the upper 50 percentile and those ranked in the lower 50 percentile) so that both higher and lower performers would be included in the study. In stage two, we classified all CHCs into three clusters based on their geographic location: urban, suburban or rural. Computer-generated random numbers were then used to choose 4 CHCs from each cluster. In stage three, with the help of local government officials and community residential committees, we contacted the randomly selected CHCs to ask if they would like to participate in our survey. All 12 randomly selected CHCs agreed to participate in our study. In each selected CHC, the number of participants was set according to a proportion based on the total number of contracted residents above 40 years old in each CHC. 200 to 225 participants from the various communities were selected in each CHC. Recruited subjects were selected based on three criteria: 1) aged 40 years or above; 2) were contracted residents in the community, and 3) had visited the given CHC at least twice within the past half year prior to the study. The survey was conducted from August 2019 to December 2019.

Measurement

Participants' experiences with primary care were measured using the Primary Care Assessment Tool-Adult Edition (PCAT-AE), which was designed by Professor Barbara Starfield and Leiyu Shi of the Primary Care Policy Center at Johns Hopkins University. This tool has been widely used and tested in many countries including the U.S., Canada, Japan, South Korea, and China^[25–29]. The Chinese version of the PCAT questionnaire was tested and proved to have good reliability and validity^[27, 30]. We obtained the designers' consent to use the questionnaire for this study. Data were collected through face-to-face interviews and questionnaires administered by investigators in the cross-sectional study.

The PCAT-AE was designed to be consistent with the core functions of primary care. A total of 87 items were developed to assess ten domains of participants' primary care experience: first contact (accessibility and utilization), ongoing care, coordination (information and referral systems), comprehensiveness (service availability and service provided), community orientation, family-centeredness, and cultural competence (Table 1). A four-point Likert-type scale was adopted where 1 = definitely not, 2 = probably not, 3 = probably, 4 = definitely, and 9 = not sure/don't know. Scores for each domain were derived from the average score of all items within the domain. Most respondents in our study (n = 1553) did not need referral to seek service in hospitals; thus, when calculating the total PCAT score, coordination (referral system) was not considered. According to the PCAT Manual, higher scores indicate better patient primary care experience^[27, 31].

Table 1
Interpretation of PCAT-AE Domains

Domain	Number of items	Interpretation
1. First contact-utilization	3	General routine examination, first diagnosis of new health problems, etc.
2. First contact-accessibility	10	Business hours, receiving medical treatment in one day, telephone consultation, evening home visit, appointment for general physical examination, waiting time, difficulty obtaining medical treatment, expectation value, etc.
3. Ongoing care	14	Receiving care from the same physician/nurse, communication with medical staff, understanding of living and health conditions, etc.
4. Coordination (Referral system)	8	Referral service between primary care and specialists
5. Coordination (Information system)	3	Previous medical records
6. Comprehensiveness (Services available)	32	Available medical services in the CHC
7. Comprehensiveness (Services provided)	6	Some of the services involved in the process
8. Family-centeredness	4	Family involvement in medical procedures, family history
9. Community orientation	5	Family visit, understanding of regional health issues, listening to others
10. Cultural competence	2	Recommended to relatives and friends

In addition, the questionnaire included items about socio-demographic characteristics such as gender, age, marital status, employment status, education, average monthly family income, and health insurance. Items measuring health service utilization were also included, such as the frequency of seeking health services at the CHC, the number of times seeking outpatient service in the past year, self-perceived health status, physical or mental disease lasting over one year, and chronic disease.

Analysis

All data were analysed using SAS Software 9.30. Chi-square tests were conducted to compare socio-demographic characteristics and healthcare utilization of participants among CHCs in the three geographic areas (i.e., urban, suburban, and rural). Analysis of covariance was used to compare PCAT domain scores and total scores among the three types of CHCs. Multivariate linear regression was then performed to explore the relationship between CHC type and reported primary care quality (total PCAT score), controlling for respondents' socio-demographic and healthcare utilization measures. Two multiple linear regression models were used to explore factors associated with PCAT total scores. Model I included only CHC type, while model II controlled for socio-demographic and healthcare utilization measures. Of all the participants, only 851 contracted residents reported experiencing a referral. Therefore, when conducting the multiple linear regressions, total PCAT scores were calculated by summing the mean scores for all domains except coordination (referral system).

Results

As shown in Table 2, the proportion of respondents from urban, suburban, and rural areas was roughly similar (31.91%, 34.07% and 34.03%, respectively). In total, there were more female (54.78%), 61-70-year-old (47.80%), married (98.88%), and unemployed/retired (63.85%) respondents. Most individuals' highest education was either primary school or below (37.44%) or junior school (35.27%), and 34.73% had an average monthly family income < 3,000 RMB. 82.53% had health insurance. In terms of health service utilization, the majority sought services at CHCs more than once per month (72.80%). A higher proportion sought outpatient services less than 10 times in the previous year (33.32%), followed by > 20 (27.08%) and 10-15 times (26.04%). The majority respondents did not have inpatient hospitalization in the previous year (86.69%). Most respondents reported poor/fair health status (57.45%), and most also reported having no physical or mental disease lasting over one year (70.63%). The majority of participants had at least one chronic disease (89.06%).

Table 2
Comparison of Participants' Characteristics from CHCs in Urban, Suburban, and Rural Areas of Shanghai

Variable	Group	District								Chi-square	P value
		Total (n = 2404)		Urban (n = 767)		Suburb (n = 819)		Rural (n = 818)			
		N	%	N	%	N	%	N	%		
Socio-demographic characteristics											
Gender	Male	1087	45.22	329	42.89	358	43.71	400	48.90	6.90	0.03
	Female	1317	54.78	438	57.11	461	56.29	418	51.10		
Age (year)	≤ 60	504	20.97	128	16.69	207	25.27	169	20.66	22.62	< 0.001
	61–70	1149	47.80	380	49.54	392	47.86	377	46.09		
	> 70	751	31.24	259	33.77	220	26.86	272	33.25		
Marital status	Married	2377	98.88	752	98.04	813	99.27	812	99.27	7.03	0.03
	Unmarried	27	1.12	15	1.96	6	0.73	6	0.73		
Employment status	Employed	869	36.15	69	9.00	223	27.23	577	70.54	692.06	< 0.001
	Unemployed/retired	1535	63.85	698	91.00	596	72.77	241	29.46		
Education (missing = 6)	Primary school or below	900	37.53	29	3.78	383	46.76	488	59.66	688.04	< 0.001
	Junior school	848	35.36	329	42.89	287	35.04	232	28.36		
	Senior high school	450	18.77	294	38.33	85	10.38	71	8.68		
	College or above	200	8.34	115	14.99	64	7.81	21	2.57		
Average monthly family income (RMB)	< 3,000	835	34.73	35	4.56	186	22.71	614	75.06	967.48	< 0.001
	3,000–4,000	515	21.42	225	29.34	195	23.81	95	11.61		
	4,001–6,000	503	20.92	259	33.77	187	22.83	57	6.97		
	≥ 6,000	305	12.69	137	17.86	145	17.70	23	2.81		
	Not sure	246	10.23	111	14.47	106	12.94	29	3.55		
Health insurance	No	420	17.47	143	18.64	115	14.04	162	19.80	10.50	0.01
	Yes	1984	82.53	624	81.36	704	85.96	656	80.20		
Health service utilization											
Frequency of seeking health service in CHC	More than once per month	1750	72.80	635	82.79	600	73.26	515	62.96	94.51	< 0.001
	Every one to three months	311	12.94	71	9.26	119	14.53	121	14.79		
	More than every three months	245	10.19	43	5.61	75	9.16	127	15.53		
	Don't know/Not sure	98	4.08	18	2.35	25	3.05	55	6.72		
Times seeking outpatient service in the previous year	≤ 10	801	33.32	123	16.04	283	34.55	395	48.29	344.99	< 0.001
	10–14	626	26.04	168	21.90	251	30.65	207	25.31		
	15–20	326	13.56	123	16.04	155	18.93	48	5.87		
	> 20	651	27.08	353	46.02	130	15.87	168	20.54		
Hospitalization in the previous year (missing = 27)	0	2084	87.67	665	86.70	729	89.01	690	84.35	14.8	0.01
	1	231	9.72	86	11.21	61	7.45	84	10.27		
	≥ 2	62	2.61	13	1.69	18	2.20	31	3.79		
Self-perceived health status	Poor/Fair	1381	57.45	504	65.71	342	41.76	535	65.40	125.02	< 0.001

Variable	Group	District								Chi-square	P value
		Total (n = 2404)		Urban (n = 767)		Suburb (n = 819)		Rural (n = 818)			
		N	%	N	%	N	%	N	%		
	Good/Excellent	1023	42.55	263	34.29	477	58.24	283	34.60		
Physical or mental disease lasting over one year	Yes	527	21.92	155	20.21	202	24.66	170	20.78	34.95	< 0.001
	No	1698	70.63	579	75.49	563	68.74	556	67.97		
	Not sure	179	7.45	33	4.30	54	6.59	92	11.25		
Chronic disease	Yes	2141	89.06	705	91.92	716	87.42	720	88.02	9.58	0.01
	No	263	10.94	62	8.08	103	12.58	98	11.98		

Table 2 also compares the socio-demographic characteristics and health service utilization among urban, suburban, and rural CHC users. Similar to the total distribution, participants in each area were more likely to be female, 61–70 years of age, married, unemployed/retired, have an educational attainment at the junior or senior high school level, have health insurance, seek out health services at the CHC more than once per month, sought out outpatient services ≤ 10 times in the previous year, had no hospitalization in the previous year, reported poor/fair health status, have no physical or mental disease lasting over one year, and have at least one chronic disease. However, more urban participants were distributed in the 4,001–6,000 RMB income interval, while suburban participants were more likely to be in the 3,000–4,000 RMB interval and rural participants in the < 3,000 RMB interval.

Table 3 compares scores from each of the 10 primary care domains and total PCAT scores according to participants' socio-demographic characteristics. Since all mean domain scores are above 2 (which denotes probably not), the results indicate that respondents in general reported positive experience with their primary care at the CHCs. Respondents were particularly pleased with first contact (utilization), followed by family centeredness, comprehensiveness (services provided), coordination (referral), comprehensiveness (services available), ongoing care, cultural competence, and community orientation. All these domains scored above 3 indicating generally positive experience. Only first contact (accessibility) and coordination (information system) scored less than 3 indicating rooms for improvement.

Table 3
Comparison of PCAT Scores by Participants' Characteristics

Variable	Group	First contact (utilization)	First contact (accessibility)	Ongoing care	Coordination (Referral system)	Coordination (Information system)	Comprehensiveness (available)	Comprehensiveness (provided)
		Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Socio-demographic characteristics								
Gender	Male	3.51(0.54)	2.92(0.48)	3.16(0.41)	3.23(0.56)	2.77(0.36)	3.19(0.57)	3.26(0.54)
	Female	3.51(0.57)	2.87(0.47)	3.17(0.42)	3.22(0.60)	2.74(0.39)	3.21(0.57)	3.26(0.53)
Age (year)	≤ 60	3.53(0.54)	2.92(0.44)	3.22(0.39) ***	3.19(0.56)	2.80(0.34)	3.28(0.56) ***	3.34(0.49) ***
	61–70	3.5(0.56)	2.90(0.5)	3.14(0.43)	3.17(0.61)	2.75(0.39)	3.19(0.58)	3.23(0.54)
	> 70	3.51(0.56)	2.86(0.47)	3.16(0.39)	3.31(0.54) ***	2.74(0.39)	3.15(0.56)	3.24(0.55)
Marital status	Married	3.51(0.56)	2.89(0.48)	3.16(0.41)	3.22(0.58)	2.76(0.38)	3.20(0.57)	3.26(0.54)
	Unmarried	3.42(0.64)	2.77(0.71)	3.17(0.36)	3.45(0.34)	2.69(0.44)	3.06(0.73)	3.19(0.58)
Employment status	Employed	3.54(0.49)	3.00(0.47) ***	3.14(0.40)	3.24(0.50)	2.74(0.39)	3.17(0.54)	3.23(0.54)
	Unemployed/retired	3.50(0.59)	2.83(0.47)	3.18(0.42) *	3.21(0.62)	2.77(0.37)	3.22(0.59) *	3.27(0.53) *
Education (missing = 6)	Primary school or below	3.62(0.52) ***	2.99(0.43) ***	3.17(0.46)	3.25(0.52)	2.72(0.40)	3.29(0.51) ***	3.30(0.54)
	Junior school	3.45(0.56)	2.88(0.49)	3.17(0.37)	3.20(0.56)	2.77(0.36)	3.18(0.60)	3.21(0.54)
	Senior high school	3.41(0.58)	2.73(0.47)	3.10(0.40)	3.15(0.69)	2.78(0.37)	3.05(0.63)	3.22(0.51)
	College or above	3.51(0.61)	2.82(0.55)	3.28(0.37) ***	3.41(0.54) *	2.80(0.32) ***	3.21(0.49)	3.39(0.51) ***
Average monthly family income (RMB)	< 3,000	3.56(0.55) ***	3.00(0.46) *	3.13(0.48)	3.29(0.50)	2.78(0.37)	3.23(0.57)	3.26(0.56)
	3,000–4,000	3.44(0.57)	2.86(0.46)	3.23(0.34) *	3.41(0.45) ***	2.82(0.32) ***	3.30(0.48) ***	3.33(0.50)
	4,001–6,000	3.53(0.55)	2.80(0.49)	3.21(0.39)	3.30(0.53)	2.73(0.39)	3.26(0.52)	3.33(0.54) ***
	≥ 6,000	3.49(0.54)	2.88(0.51)	3.20(0.38)	3.06(0.66)	2.69(0.43)	3.11(0.63)	3.21(0.48)
	Not sure	3.49(0.58)	2.78(0.44)	3.01(0.35)	2.89(0.70)	2.70(0.42)	2.88(0.67)	3.02(0.50)
Health insurance	No	3.38(0.49)	2.89(0.46)	3.07(0.35)	3.22(0.50)	2.77(0.32)	3.18(0.51)	3.16(0.56)
	Yes	3.54(0.57) ***	2.89(0.48)	3.18(0.42) ***	3.22(0.60)	2.76(0.39)	3.20(0.59)	3.28(0.53) ***
Health service utilization								

Note: Most of the respondents in our study (n = 1553) did not need referrals to seek care in hospitals. Thus, when calculating the total PCAT score, coordinati

* Significance of P < 0.05, ** Significance of P < 0.01, *** Significance of P < 0.001

Variable	Group	First contact (utilization)	First contact (accessibility)	Ongoing care	Coordination (Referral system)	Coordination (Information system)	Comprehensiveness (available)	Comprehensiveness (provided)
Frequency of seeking health service in CHC	More than once per month	3.51(0.57)	2.87(0.48)	3.18(0.42) *	3.23(0.56)	2.76(0.37)	3.19(0.60)	3.26(0.54)
	Every one to three months	3.50(0.56)	2.93(0.51)	3.12(0.40)	3.16(0.65)	2.73(0.39)	3.24(0.50)	3.25(0.52)
	More than every three months	3.50(0.49)	2.96(0.46) *	3.11(0.37)	3.28(0.61)	2.80(0.39)	3.24(0.51)	3.24(0.53)
	Don't know/not sure	3.57(0.52)	2.95(0.41)	3.12(0.40)	3.14(0.62)	2.79(0.36)	3.17(0.50)	3.28(0.48)
Times seeking outpatient service in the previous year	≤ 10	3.55(0.52)	3.00(0.45) ***	3.13(0.39)	3.30(0.51) *	2.78(0.39)	3.30(0.47) ***	3.31(0.51)
	10–14	3.60(0.49)	2.98(0.43)	3.24(0.38)	3.22(0.62)	2.75(0.38)	3.21(0.66)	3.32(0.52)
	15–20	3.61(0.52) ***	2.84(0.42)	3.30(0.40) ***	3.12(0.72)	2.81(0.32) ***	3.26(0.60)	3.43(0.56) ***
	> 20	3.33(0.64)	2.69(0.52)	3.06(0.45)	3.19(0.54)	2.72(0.39)	3.03(0.55)	3.05(0.52)
Times seeking inpatient service in the previous year (missing = 27)	0	3.51(0.56)	2.90(0.48)	3.16(0.42)	3.23(0.58)	2.76(0.37)	3.21(0.58) *	3.27(0.54) *
	1	3.53(0.54)	2.81(0.47)	3.13(0.37)	3.20(0.59)	2.75(0.41)	3.11(0.54)	3.15(0.55)
	≥ 2	3.57(0.49) **	2.99(0.47)	3.23(0.36)	3.28(0.54)	2.71(0.40)	3.21(0.52)	3.23(0.52)
Self-perceived health status	Poor/Fair	3.47(0.59)	2.86(0.50)	3.12(0.44)	3.27(0.54) ***	2.75(0.38)	3.19(0.56)	3.22(0.55)
	Good/Excellent	3.57(0.51) ***	2.93(0.44) ***	3.22(0.38) ***	3.13(0.63)	2.76(0.38)	3.20(0.59)	3.30(0.52) ***
Physical or mental disease lasting over one year	Yes	3.47(0.62)	3.01(0.47) ***	3.21(0.38) ***	3.36(0.51) ***	2.75(0.39)	3.38(0.45) ***	3.31(0.50) ***
	No	3.52(0.55)	2.87(0.47)	3.16(0.43)	3.14(0.61)	2.77(0.37) ***	3.16(0.59)	3.25(0.55)
	Not sure	3.57(0.45)	2.74(0.54)	3.03(0.36)	3.33(0.52)	2.67(0.37)	3.02(0.57)	3.13(0.49)
Chronic disease	Yes	3.52(0.56) *	2.89(0.48)	3.17(0.41) ***	3.23(0.57)	2.76(0.38)	3.20(0.58)	3.27(0.53) *
	No	3.45(0.55)	2.87(0.47)	3.07(0.41)	3.12(0.66)	2.78(0.35)	3.19(0.48)	3.19(0.55)
Total		3.51(0.56)	2.89(0.48)	3.16(0.41)	3.22(0.58)	2.76(0.38)	3.20(0.57)	3.26(0.54)
Note: Most of the respondents in our study (n = 1553) did not need referrals to seek care in hospitals. Thus, when calculating the total PCAT score, coordination								
* Significance of P < 0.05, ** Significance of P < 0.01, *** Significance of P < 0.001								

Patients under 60 years of age, with an education level of college or above, an average monthly family income ranging from 3,000 to 4,000 RMB, with 15–20 outpatient visits in the previous year, having no hospitalization in the previous year, having physical or mental disease lasting over one year, and from the suburban area were more likely to report higher total PCAT scores. Specifically, the scores for first contact (utilization), first contact (accessibility), ongoing care, coordination (referral system), comprehensiveness (available), comprehensiveness (provided), family-centeredness, community orientation, and cultural competence were significantly higher for suburban participants ($P < 0.001$). However, coordination (information systems) was perceived higher in urban ($P < 0.001$) (Fig. 2).

The multiple linear regression models indicated that geographic area was significantly associated with total PCAT scores in model I (Table 4). After controlling for socio-demographics and health service utilization, participants in suburban CHCs were more likely to report higher total PCAT scores compared to urban participants ($\beta = 1.57$, $P < 0.001$). Respondents who perceived higher total PCAT scores were also more likely to be older in age (61–70 years: $\beta = -0.60$, $P < 0.001$; >70 years: $\beta = -0.52$, $P = 0.01$), to seek health services at the CHC every one to three months ($\beta = -0.66$, $P < 0.001$) and more than every three months ($\beta = -0.56$, $P = 0.02$), have no physical or mental disease lasting over one year ($\beta = -0.49$, $P < 0.001$), and have no chronic disease ($\beta = -0.81$, $P < 0.001$). Also, those with a

college education or above ($\beta=0.81$, $P < 0.001$), with an average monthly family income of $\geq 6,000$ RMB ($\beta=-1.24$, $P < 0.001$), had >20 outpatient visits in the previous year ($\beta=-1.81$, $P < 0.001$), and with self-perceived good/excellent health statuses ($\beta=0.35$, $P = 0.01$) reported significantly lower total PCAT scores.

Table 4
Linear Regressions on Total PCAT Scores

Variable	Group	Model I			Model II		
		β	T value	P value	β	T value	P value
District	Urban	Ref.			Ref.		
	Suburban	2.18	14.16	< 0.001	1.57	8.90	< 0.001
	Rural	0.47	3.05	< 0.01	-0.21	-0.93	0.35
Socio-demographic characteristics							
Gender	Male				Ref.		
	Female				-0.07	-0.57	0.57
Age (year)	≤ 60				Ref.		
	61–70				-0.60	-3.51	< 0.001
	> 70				-0.52	-2.79	0.01
Marital status	Married				Ref.		
	Unmarried				-0.63	-1.11	0.27
Employment status	Employed				Ref.		
	Unemployed/retired				0.18	1.15	0.25
Education	Primary school or below				Ref.		
	Junior school				-0.22	-1.34	0.18
	Senior high school				-0.13	-0.63	0.53
	College or above				0.81	3.11	< 0.001
Average monthly family income (RMB)	< 3,000				Ref.		
	3,000–4,000				-0.07	-0.34	0.73
	4,001– 6,000				-0.33	-1.62	0.11
	≥ 6,000				-1.24	-5.21	< 0.001
	Not sure				-2.07	-8.46	< 0.001
Health insurance	No				Ref.		
	Yes				0.20	1.25	0.21
Health service utilization							
Frequency of seeking health service in CHC	More than once per month				Ref.		
	Every one to three months				-0.66	-3.15	< 0.001
	More than every three months				-0.56	-2.38	0.02
	Don't know/Not sure				0.02	0.07	0.94
Times seeking outpatient service in the previous year	≤ 10				Ref.		
	10–15				-0.34	-1.81	0.07
	15–20				0.02	0.10	0.92
	> 20				-1.81	-9.27	< 0.001
Times seeking inpatient service in the previous year	0				Ref.		
	1				0.05	0.27	0.79
	≥ 2				0.43	1.13	0.26
Self-perceived health status	Poor/Fair				Ref.		
	Good/Excellent				0.35	2.58	0.01
Physical or mental disease lasting over one year	Yes				Ref.		
	No				-0.49	-3.20	< 0.001

Variable	Group	Model I	Model II		
	Not sure		-1.48	-5.75	< 0.001
Chronic disease	Yes		Ref.		
	No		-0.81	-3.70	< 0.001
Adjusted R square		0.086	0.204		

Discussion

Following WHO's initiatives to advance primary care, a rising number of developing countries were establishing and improving its primary care system, among them China has been making great efforts. As one of the early cities in China to develop CHCs, the Shanghai Municipal Health Commission issued a series of policies. The noteworthy "1 + 1 + 1" personal family doctor contract program was developed to encourage more residents to utilize primary care. By using the internationally developed and validated PCAT, we examined residents' primary care experience in CHCs situated in urban, suburban, and rural areas of Shanghai Metropolitan. Overall, even though respondents in our study generally reported positive experience with their primary care services, it was found that they gave lower PCAT scores than patients from CHCs in the U.S.^[27, 32] This may be explained by China's still under-developed primary health care system, especially when compared with developed countries. However, in our study, the absolute differences in domains and total PCAT scores for CHCs across different geographic areas were small, which was comparable to a previous study conducted in other regions of China^[33]. When comparing with the other China-based studies, the total PCAT score was a little lower than that of a study conducted in the Guangdong Province, which used a usual source of primary care as its study site^[34]. This disparity may be caused by sample differences, since we included contracted residents who more frequently utilize both medical and health management and may be more attuned to the defects of their CHCs. The more abundant and competitive medical services provided in larger hospitals in Shanghai may also lead to worse perceptions of primary care at CHCs.

Interestingly, comparing the perceptions of CHCs in various regions within Shanghai indicated that contracted patients at suburban CHCs perceived higher total PCAT scores, followed by patients at urban and rural CHCs. In Shanghai and other regions in China, CHC revenue and expenditure are separate, meaning that CHCs obtain all their subsidies from financial investment. The amount of governmental investment is set by the amount of service provided by the CHC in the previous year^[35]. As such, CHC development is largely dependent on regional subsidies and the state of surrounding competitive health institutions. Urban areas of Shanghai contain an abundance of secondary and tertiary hospitals. As no strict referral system exists in China^[36], the operation of urban CHCs is largely influenced by fewer financial subsidies that may have an impact on primary care quality. Due to advanced urbanization planning, regional suburban governments obtain more financial investment from the Shanghai municipal government. There is also less competition as fewer large hospitals exist in the suburbs. These added benefits are conducive to CHC development and may improve the quality of primary care in suburban areas. In rural areas, residents' perceived PCAT scores were also higher than the urban CHCs, which is consistent with a previous study conducted in the Guangdong province^[37]. This can also be explained by more regional subsidies and less competition from big hospitals.

Regarding the various domains of the PCAT, our results showed that CHCs in suburban districts performed the best in all PCAT domains except for coordination (information systems). This domain represents the convenience of access to patients' electronic medical records and was found to be best in urban CHCs. This can be explained by the fact that information system development was undertaken by the local urban district for both CHCs and higher-level hospitals. Benefiting from a unified information construction effort, CHCs in urban areas acquired better access to patient medical information^[38]. However, among all individual domain scores on the PCAT, the average score for information systems was still the lowest. This indicates that much can be done to improve this specific area. For the other domains, CHCs in rural areas were superior to urban areas but inferior to suburban ones, including in first contact (utilization), first contact (accessibility), ongoing care, coordination (referral system), comprehensiveness (available), comprehensiveness (provided), family-centeredness, community orientation, and cultural competence. These results differ from an early study based on a sample of 645 adult users from Canada (in Quebec and Nova Scotia), which reported poorer first-contact access in rural areas than in urban areas^[39].

With regards to the discrepancy in participants' perceptions of the coordination domain of primary care, Patricia et al. (2018) showed that primary care in metropolitan districts of Granada achieved good accessibility scores^[40]. On the other hand, Alhassan et al. (2016) reported that quality health care in Ghanaian health facilities was not affected by geographical location (rural or urban)^[41]. CHCs in rural areas of Shanghai mostly grew out from regional hospitals as required by health reform. These CHCs initially had well-functioning medical teams and typically operated as regional medical centers since few high-level hospitals were available. Normally, CHCs in rural areas operate on non-working days and experience more pressure for emergency treatment. Specific measures laid out in 2018 to further implement the two-way referral system for residents in the '1 + 1 + 1' contracted program stipulate the details of referral coordination between CHCs and hospitals^[42]. However, as discussed above, a limited referral system in China has resulted in free choice for patients to decide where they want to seek primary care. This has weakened appropriate referral arrangements and was most obvious in the urban area^[43].

It should be noted that ongoing care/continuity is particularly important for primary care patients, as contracted residents are more likely to use health services more frequently and can benefit from a closer patient-provider relationship^[34]. However, CHCs in urban areas have much room for improvement in this domain. Regarding the other domains of comprehensiveness (available), comprehensiveness (provided), family-centeredness, community orientation, and cultural competence, higher scores were given in suburban and rural areas. This could possibly be due to the following factors: convenient travel distance to CHCs, no appointments required, and shorter waiting time^[34].

Our results indicated that respondents who were older and in relatively good health would perceive higher total PCAT scores. This was consistent with a Korean study based on sample data collected from patients whose usual source of care came from family doctors working at nine private clinics. The Korean

Primary Care Assessment Tool also found that primary care quality was positively associated with good self-rated health status^[44]. It also found that those with an education of college or above and higher average income would perceive significantly lower total PCAT scores. This may be caused by participants in these groups being more inclined to seek out higher-level hospitals for care. Another previous study in China found that compared with other types of health care facilities, tertiary hospital users had higher proportions of patients with higher education, employment and income levels^[34].

Several limitations must be taken into account for this study. First, although the sampling of CHCs was randomly chosen in the cross-sectional study, the sampling of contracted residents was not well-randomized. Participants were selected at each CHC as they were seeking out services, making the age of our sample relatively old. Second, survey data were based entirely off of self-reports and thus may be subject to recall bias. Third, the study examined contracted patients' subjective experiences of primary care rather than objective health outcomes. Patients' perceived experiences may vary as a result of their expectations and unique characteristics.

Conclusions

The results of the study affirmed the CHC model in the delivering of quality primary care. CHC users generally reported high quality primary care experience especially in the domain of first-contact (utilization), family centeredness, and comprehensiveness (services provided). The finding that suburban and rural CHC users reported better primary care experience than urban CHCs demonstrates the unique value of CHCs in relatively medical underserved areas. Our findings provide insight to help inform policy decisions for primary care development in major cities, where more competition from higher-level hospitals and issues with local subsidies influence its development. To improve residents' experiences of primary care, relevant policies including a strict referral system to ensure CHCs play a gatekeeping role should be implemented. Adequate funding for CHCs should also be provided, especially for those in urban areas. For CHCs in suburban and rural areas, measures should be used to improve their rudimentary information systems. This study may provide evidence for global countries or regions undergoing urbanization to better improve their primary care quality.

Abbreviations

CHCs
Community Healthcare Centers
PCAT
Primary Care Assessment Tool
WHO
World Health Organization
PCAT-AE
Primary Care Assessment Tool-Adult Edition

Declarations

Ethics approval and consent to participate

We acquired the written informed consent from the study participants. This study was approved by the Ethics Committees of Tongji University (ref: LL-2016-ZRXX-017). Participant personal information was not available to individuals who did not participate in the research.

Consent for publication

Not applicable.

Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have declared that no conflict of interest exists.

Funding

The design of this study involving some previous investigation was supported by the Shanghai Excellent Young Talents Project in Health System (2018YQ52). Data extraction was financially funded by the Natural Science Foundation of China (71774116; 71603182). The analysis and interpretation of the data guided by the statisticians were funded by the supported by grants from the National Key R&D Program of China (2018YFC2000700). The writing and revision, including the language improvement, were sponsored by Shanghai Pujiang Program (2019PJC072).

Authors' contributions

Conceived and designed the study: JWS, LYS and DHY. Analyzed the data: HJ, CC, and XHG. Contributed reagents/materials/analysis tools: YL, HZZ, and ZXW. Wrote the paper: JWS and ZXW. All authors have read and approved the manuscript.

Acknowledgements

We sincerely acknowledge and appreciate the assistance of community healthcare centers in Shanghai for their help in collecting the data.

References

1. World Health Organization. (2020). Primary health care. https://www.who.int/health-topics/primary-health-care#tab=tab_1. Accessed May 2, 2020.
2. Waddington R. Portugal's rapid progress through primary health care. *Bull World Health Organ*. 2008;86(11):826–7.
3. Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: An international comparative study. *Br J Gen Pract*. 2013;63(616):E742–50.
4. Chen Z. Launch of the health-care reform plan in China. *The Lancet*. 2009;373(9672):1322–4.
5. Yip W, Hsiao W. (2014). Harnessing the privatisation of China's fragmented health-care delivery. *The Lancet*, 384(9945), 805 – 18.
6. Shanghai Municipal People's Government. (2015). Guiding Opinions on Further Promoting the Comprehensive Reform and Development of the Municipal Community Health Service. <http://www.shanghai.gov.cn/nw2/nw2314/nw32792/nw38917/nw38919/u26aw41751.html>. Accessed April 23, 2020.
7. Shanghai Municipal People's Government. (2013). Guidance on the comprehensive promotion of family doctor system in this city. <https://www.yicai.com/news/100095345.html>. Accessed April 23, 2020.
8. Shi L, Starfield B, Xu JH. Validating the adult primary care assessment tool. *The Journal of Family Practice*. 2001;50(2):161–75.
9. Haggerty JL, Burge F, Beaulieu MD, Pineault R, Beaulieu C, Levesque JF, et al. Validation of instruments to evaluate primary healthcare from the patient perspective: overview of the method. *Healthcare Policy*. 2011;7(S):31–46.
10. Pena FV, Harzheim E, Terrasa S, Berra S. Psychometric validation in Spanish of the Brazilian short version of the Primary Care Assessment Tools-users questionnaire for the evaluation of the orientation of health systems towards primary care. *ATENCION PRIMARIA*. 2017;49(2):69–76.
11. Harzheim E, Pinto LF, D'Avila OP, Hauser L. Brazilian National Institute of Geography and Statistics (IBGE) in partnership with Brazilian Ministry of Health launch the major national household survey using Primary Care Assessment Tool (PCAT) in the world. *Journal of Family Medicine Primary Care*. 2019;8:4042–3.
12. Cho Y, Chung H, Joo H, Park HJ, Joh HK, Kim JW, et al. Comparison of patient perceptions of primary care quality across healthcare facilities in Korea: A cross-sectional study. *PLoS ONE*. 2020;15(3):e0230034.
13. Li LN, Zhong CW, Mei J, Liang Y, Li L, Kuang L. Effect of family practice contract services on the quality of primary care in Guangzhou, China: A cross-sectional study using PCAT-AE. *BMJ Open*. 2018;8(11):e021317.
14. Shi L, Starfield B, Xu JH. Validating the adult primary care assessment tool. *The Journal of Family Practice*. 2001;50(2):161–75.
15. Shi L, Lee DC, Chung M, Liang H, Lock D, Sripipatana A. Patient-Centered Medical Home Recognition and Clinical Performance in U.S. Community Health Centers. *Health Services Research*. 2016. doi:10.1111/1475-6773.12523.
16. Probst JC, Laditka JN, Laditka SB. Association between community health center and rural health clinic presence and county-level hospitalization rates for ambulatory care sensitive conditions: An analysis across eight US states. *BMC Health Services Research*. 2009;9:134–69.
17. Shanghai Statistics Bureau. (2017). Statistical bulletin of Shanghai's national economic and social development (2016). <http://www.stats-sh.gov.cn/html/sjfb/201703/293816.html>. Accessed April 23, 2020.
18. Cai LQ, Hou J, Lu XJ. Effectiveness evaluation of on-the-job training for general practitioners in rural community health service center in the outlying suburbs of Shanghai. *Chinese Journal of General Practice*. 2019;17(02):256–8.
19. People's Daily Online. (2014). Eight Reform Tasks of Health and Family Planning Work in Pudong New Area for this year. <http://sh.people.com.cn/n/2014/0331/c215689-20895302.html>.
20. Liu, M. (2015). Financing Policy Research on the Community Health Services in a Certain District of Shanghai. Shanghai Jiaotong University.
21. Gao SR, Li YT, Liu SS, Lou JQ, Jing Y, Zhou SY, et al. Reflect on the Health Integration Development of Urban and Rural Region in Pudong New Area. *Chinese Primary Health Care*. 2014;28(10):21–4.
22. Chen, R. (2013). Analysis on the Running and Equity Evaluation on the allocation of health resources of community health service centers in Shanghai from 2013 to 2011. The Second Military Medical University.
23. Zhang, A. (2014). Research on Community Health Service Efficiency and Evidence-based Analysis in Shanghai. Shanghai Jiaotong University.
24. Shanghai Clinical Quality Center of General Practice. (n.d.). Expert Consultation Questionnaire of the Construction of Clinical Quality Control Standard System for General Practice in Shanghai Community Health Center (the second round). <https://www.wjx.cn/jq/32558871.aspx>.
25. Muggah E, Hogg W, Dahrouge S, Russell G, Kristjansson E, Muldoon L, et al. (2014). Patient-reported access to primary care in Ontario: Effect of organizational characteristics. *Canadian Family Physician*, 60(1), e24-31. PMID: 24452575.
26. Russell G, Dahrouge S, Tuna M, Hogg W, Geneau R, Gebremichael G. Getting it all done. Organizational factors linked with comprehensive primary care. *Fam Pract*. 2010;27(5):535–41. doi:10.1093/fampra/cm037.
27. Shi L, Starfield B, Xu JH. (2001). Validating the adult primary care assessment tool. *Journal of Family Practice*, 50(2), 161 – 74.
28. 10.1155/2016/6019603
Mei J, Liang Y, Shi L, Zhao JG, Wang YT, Kuang L. (2016). The development and validation of a rapid assessment tool of primary care in China. *BioMed Research International*, 2016, 6019603. doi: 10.1155/2016/6019603.
29. Feng SS, Shi L, Zeng JZ, Chen W, Ling L. Comparison of primary care experiences in village clinics with different ownership models in Guangdong Province, China. *PLoS ONE*. 2017;12(1):e0169241.

30. Yang H, Shi L, Lebrun LA, Zhou X, Liu J, Wang H. Development of the Chinese primary care assessment tool: Data quality and measurement properties. *Int J Qual Health Care*. 2013;25(1):92–105. doi:10.1093/intqhc/mzs072.
31. Starfield, B., & Shi L (2009). *Manual for the primary care assessment tools*. John Hopkins University Press.
32. Flocke SA, Miller WL, Crabtree BF. Relationships between physician practice style, patient satisfaction, and attributes of primary care. *J Fam Pract*. 2002;51(10):835–40.
33. Wang HH, Wong SY, Wong MC, et al. Patients' Experiences in Different Models of Community Health Centers in Southern China. *Annals of Family Medicine*. 2013;11(6):517–26.
34. Hu RW, Liao Y, Du ZC, Hao YT, Liang HL, Shi L. Types of health care facilities and the quality of primary care: A study of characteristics and experiences of Chinese patients in Guangdong Province, China. *BMC Health Services Research*. 2016;16:335.
35. Xu X, Zhou L, Antwi HA, Chen X. (2018). Evaluation of health resource utilization efficiency in community health centers of Jiangsu Province, China. *Human Resources for Health*, 16(1), 13.
36. Wang, Shi ZX, Wu JW, Xie ZG, Yu HL, Li YF, P, et al. Changes in chronic disease management among community health centers (CHCs) in China: Has health reform improved the CHC ability? *International Journal of Health Planning Management*. 2017;32(3):317.
37. Hu R, Liao Y, Du Z, Hao Y, Liang H, Shi L. Types of health care facilities and the quality of primary care: A study of characteristics and experiences of Chinese patients in Guangdong Province, China. *BMC Health Services Research*. 2016;16:335.
38. He JJ, Zhong H, Tang ZQ, Zhang TY, Kang Q, Wang HP, et al. Comprehensive evaluation of community health services in Shanghai in 2015. *Chinese General Practice*. 2017;20(34):4242–7.
39. Haggerty JL, Bouharaoui F, Santor DA. Differential item functioning in primary healthcare evaluation instruments by french/english version, educational level and urban/rural location. *Health Policy*. 2011;7(Spec Issue):47–65.
40. Patricia, F.C., & Sergio ML. (2018). Evaluation of Primary Care Accessibility and Longitudinality in Granada Using Primary Care Assessment Tools. *Journal of Healthcare Quality Research*, 33(3), 121–129.
41. Alhassan RK, Edward NA. Frontline staff motivation levels and health care quality in rural and urban primary health facilities: A baseline study in the Greater Accra and Western regions of Ghana. *Health Economics Review*. 2016;6:UNSP39.
42. Shanghai Municipal Health and Family Planning Commission. (2018). Implementation rules for further implementing the two-way referral work of 1 + 1 + 1 for contracted residents in this city. <http://wsjkw.sh.gov.cn/yzgl3/20181012/0012-62360.html>. Accessed April 18, 2020.
43. Xu J, Wang W, Li Y, Zhang J, Pavlova M, Liu H, et al. Analysis of factors influencing the outpatient work-load at Chinese health centres. *BMC Health Services Research*. 2010;10:151.
44. Sung NJ, Markuns JF, Park KH, Kim K, Lee H, Lee JH. Higher quality primary care is associated with good self-rated health status. *Fam Pract*. 2013;30(5):568–75.

Figures

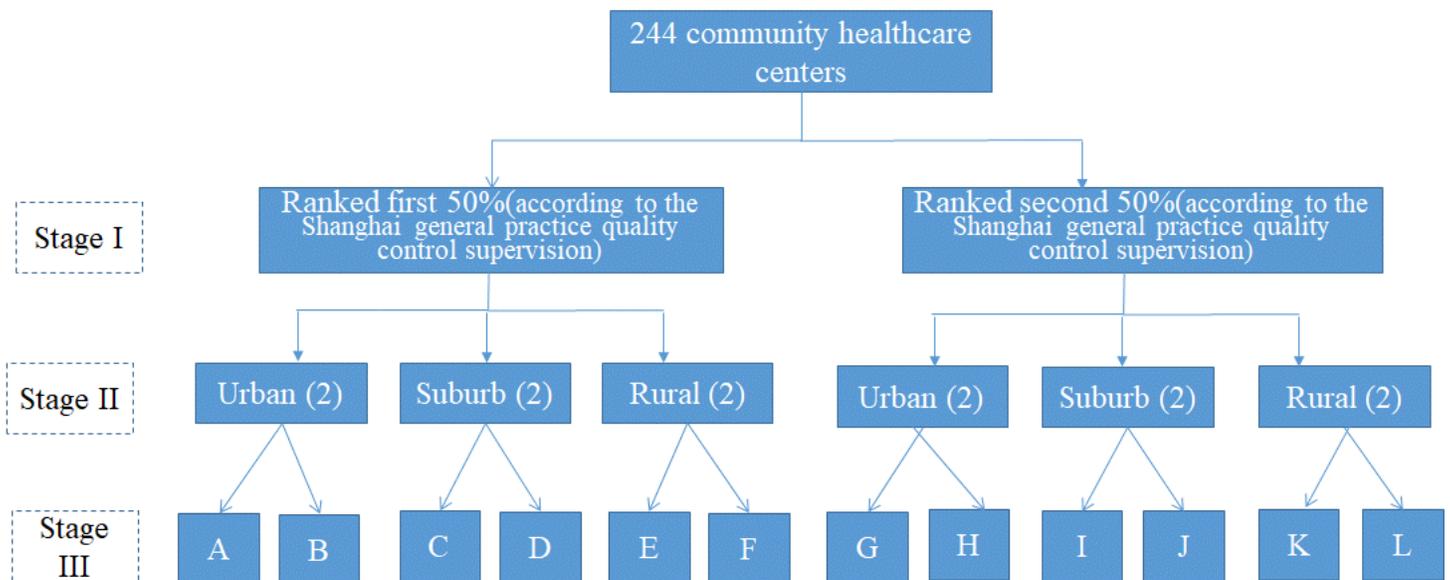


Figure 1

Process of selection of community healthcare centers in various regions in Shanghai

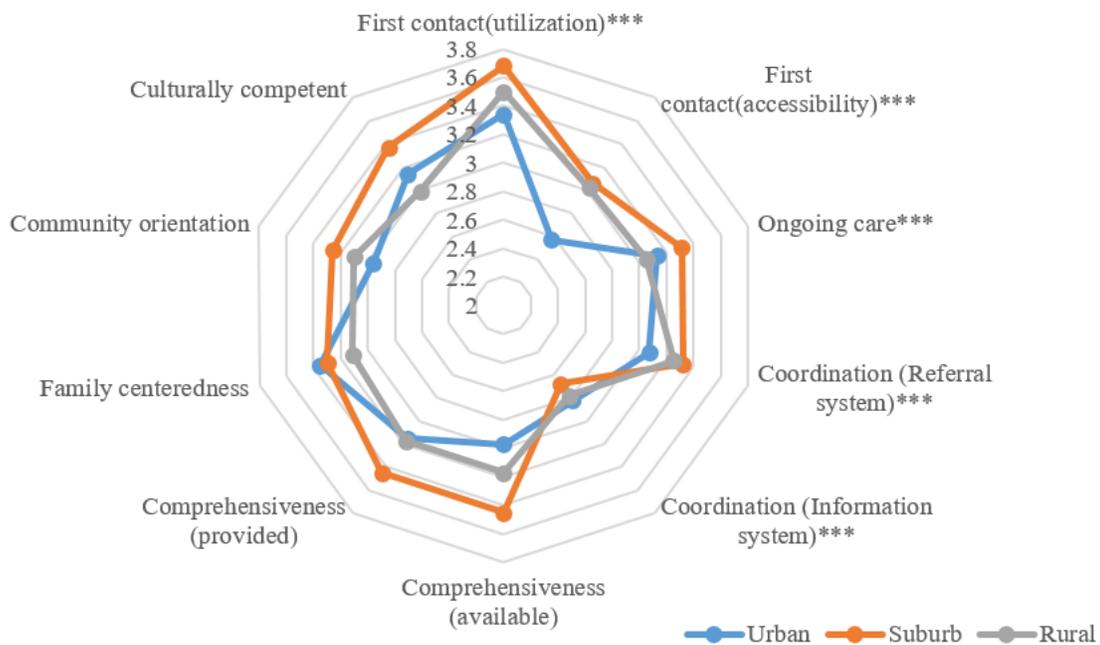


Figure 2
 Comparison of Various PCAT Domains among CHCs in Urban, Suburban, and Rural Areas Note: Significance of $P < 0.05$, ** Significance of $P < 0.01$, *** Significance of $P < 0.001$.