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Impact of Appointment-Based Healthcare Services on the Quality of Contracted Service Outcomes under High Family Doctor Enrollment Rates: A Postprint Study

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Abstract

Background Family doctors serve as "gatekeepers" for community residents' health, yet family doctor contract services in China currently face issues such as low service quality and underutilization. Objective To comprehensively understand the current status of family doctor service contracting, fulfillment, and renewal in Meizhou and Heyuan cities of Guangdong Province, and to explore the impact of appointment-based medical services on the outcome quality of contracted services. Methods A multistage sampling method was employed to conduct in-depth interviews and questionnaire surveys with deputy directors in charge of township health centers. Wilcoxon rank-sum test and 2 test were used to compare the current status of family doctor contract services between different groups based on whether they provided appointment-based medical services. Logistic regression was utilized to analyze the impact of appointment-based medical services on the outcome quality of contracted services. Results Among 100 township health centers, the contract signing rates for priority and general populations were 69.0% (60.0%, 85.0%) and 31.8% (29.1%, 54.5%), respectively. Furthermore, 78.00% faced difficulties in service fulfillment, and 50.00% experienced low renewal rates. Compared with institutions not providing appointment-based medical services, those offering such services had a 72% reduction in the probability of experiencing fulfillment difficulties [OR: 0.28, 95%CI (0.08, 0.98); P=0.047]. Conclusion The fulfillment rate of family doctor services in Guangdong Province is closely associated with the provision of appointment-based medical services. It is recommended to enrich appointment forms and content, enhance residents' trust and motivation for proactive service utilization, and leverage Internet Plus platforms to "improve efficiency and quality," while simultaneously injecting motivation into both providers and

patients for service provision and utilization, thereby enabling the delivery of continuous, effective comprehensive medical and health services as well as health management.

Full Text

Influence of Appointment-Based Medical Services on the Quality of Contracted Service Outcomes Under the Background of High Family Physician Contracting Rates

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Abstract

Background: Family physicians serve as "gatekeepers"for community residents' health. However, China' s current family physician contracting system faces challenges including low service quality and underutilization.

Objective: To comprehensively assess the current status of contracting, performance, and renewal of family physician services in Meizhou and Heyuan cities, Guangdong Province, and to explore the impact of appointment-based medical services on the quality of contracted service outcomes.

Methods: Using multi-stage sampling, we conducted in-depth interviews and questionnaires with deputy directors of township health centers. The Wilcoxon rank-sum test and ^{2} test were used to compare the current status of family physician contracting services between groups with and without appointment services. Logistic regression was employed to analyze the influence of appointment-based medical services on contracted service outcome quality.

Results: Among 100 township health centers, the median contracting rates were 69.0% (60.0%, 85.0%) for priority populations and 31.8% (29.1%, 54.5%) for the general population. Overall, 78.00% faced difficulties in contract fulfillment, and 50.00% experienced low renewal rates. Institutions providing

appointment-based medical services had a 72% lower probability of experiencing fulfillment difficulties compared to those without such services [OR: 0.28, 95%CI (0.08, 0.98); P=0.047].

Conclusion: The contract fulfillment rate for family physicians in Guangdong Province is closely associated with the provision of appointment-based medical services. We recommend enriching appointment formats and content to enhance residents' trust and motivation to actively utilize services, leveraging Internet+ platforms to "improve efficiency and quality,"and injecting motivation for service provision and utilization from both physician and patient perspectives to ensure sustained, effective integrated healthcare and health management.

Keywords: Family physician; Appointment-based medical service; Contracted service quality

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Introduction

Family medicine evolved from general practice. The origins of the family physician system can be traced back to late 18th-century North America [1, 2], while the term "General Practitioner" first appeared in Britain' s *Lancet* magazine in the early 19th century [3], referring to physicians with diverse skills. Thus, general practice originated in 18th-century America but was named in 19th-century Europe, and family medicine subsequently developed from this foundation. The term "family physician" itself derives from the American Academy of Family Physicians, which in 1971 changed "general practitioner" to "family physician" [1, 2, 4].

The family physician system constitutes a vital component of primary healthcare delivery, establishing long-term, stable service relationships with contracted households to provide continuous, safe, appropriate, and comprehensive medical services and health management. Implementing family physician health management services not only optimizes health resource utilization but also effectively reduces medical expenses while improving residents' health outcomes [5]. Consequently, the family physician system functions as a "gatekeeper" for both residents' health and healthcare expenditure control [6]. Against the backdrop of "difficulty accessing care" caused by supply-demand imbalances and "expensive medical costs" stemming from overutilization, China has drawn upon international experiences to provide health management, chronic disease prevention, and common disease treatment services, constructing a new community healthcare system to achieve policy goals of community-based initial diagnosis, two-way referral, and tiered treatment [7].

Examining the policy evolution of China' s family physician system reveals that since 2011, it has been elevated to a national strategic priority with increasing emphasis. After a decade of exploration and practice, significant achievements have been made. However, due to its late start and immature development, the

current system suffers from low service quality, formalistic contracting processes lacking personalized services, and low service utilization rates [8].

Appointment-based outpatient services offer dual benefits: enabling patient self-scheduling to reduce waiting times and increase physician-patient communication, while also allowing family physicians to proactively schedule patients, thereby enhancing compliance with contract fulfillment and follow-up adherence [9]. Regular follow-up and revisit appointments represent important healthcare management needs for residents [10]. In the context of "difficulty accessing care," comprehensive appointment systems serve as an effective solution to improve outpatient satisfaction and physician work efficiency while enhancing service quality [11], with appointment services ranking among the top reasons residents visit community clinics [12]. Therefore, this study, from the service provider perspective and grounded in Guangdong' s actual conditions, explores how appointment-based medical services influence contracted service quality amid high family physician contracting rates, offering practical recommendations for policymakers.

Materials and Methods

1.1 Data Sources

From July to August 2021, we conducted a questionnaire survey across township health centers in 11 counties of Meizhou and Heyuan cities, Guangdong Province, using multi-stage sampling. Inclusion criteria were township-level primary care institutions that had implemented family physician contracting services and were willing to participate. Exclusion criteria included county-level hospitals and village health stations.

We utilized the "Guangdong Family Physician Contracting Service Status Survey"developed by the Guangdong Internet+ Family Physician Contracting Guidance Center. With informed consent, deputy directors or public health officers from township health centers completed online questionnaires covering institutional characteristics, family physician contracting service status, and Internet+ medical service capabilities. A total of 133 questionnaires were collected. During data management, 22 invalid questionnaires and 11 missing key information were excluded, yielding 100 valid questionnaires for analysis. This study was approved by the Ethics Committee of Guangdong Second People' s Hospital (Approval No: 2022-KY-KZ-157-02).

1.2.1 Dependent Variables

Contracted service outcome quality indicators encompassed three dimensions: effective contracting rates for general and priority populations, contract fulfillment status, and resident renewal rates. According to Guangdong Province' s implementation plan, target coverage rates were 30% for the general population and 60% for priority populations by 2020, increasing to 50% and 80% respectively by 2025. We obtained each institution' s contracting rates for general

and priority populations through online surveys with deputy directors or public health officers to assess whether targets were met. Contract fulfillment and renewal status were collected through in-depth interviews and questionnaires with the same personnel.

1.2.2 Independent Variable

The independent variable was appointment-based medical service provision, ascertained through online questionnaires with deputy directors or public health officers regarding basic medical service offerings and whether appointment systems were implemented.

1.2.3 Covariates

The family physician contracting service performance evaluation framework includes structural, process, and outcome quality dimensions [13]. Since structural and process quality influence outcome quality, our covariates encompassed institutional characteristics (service population size, per capita GDP), structural quality (workforce composition, team training, integrated healthcare network membership), and process quality (contracting channels, basic medical services, health management services, and essential public health services), all obtained through questionnaires.

1.3 Statistical Analysis

All data management and statistical analyses were performed using R version 4.0.0. All tests were two-sided, with P<0.05 considered statistically significant. Continuous variables were described using median (Q1, Q3) and compared between groups using the Wilcoxon rank-sum test. Categorical variables were expressed as frequencies (proportions) and compared using ^{2} tests. Logistic regression analyzed the impact of appointment-based medical services on contract fulfillment and renewal.

Results

2.1 Appointment-Based Medical Service Provision in Township Health Centers

As shown in , among the 100 surveyed township health centers, 58 provided appointment-based medical services (36 in Meizhou, 22 in Heyuan). Compared to institutions without appointment services, those offering such services provided significantly more types of basic medical and health management services (P<0.001) and faced lower rates of contract fulfillment difficulties (P=0.010). No statistically significant differences were observed in other characteristics, including contracting rates for general and priority populations or low renewal rates (P>0.05).

2.3 Contract Fulfillment and Renewal Challenges

Among all surveyed township health centers, 78.00% (78/100) experienced difficulties in contract fulfillment, and 50.00% (50/100) reported low renewal rates. In Meizhou, 74.58% (44/59) and 47.46% (28/59) of centers faced fulfillment and renewal challenges, respectively. Heyuan showed even higher rates, with 82.93% (34/41) experiencing fulfillment difficulties and 53.66% (22/41) reporting low renewal rates.

2.4 Impact of Appointment-Based Medical Services on Contracted Service Quality

As presented in , using 2025 targets, the priority population contracting target achievement rate was 39.66% (23/58) in institutions with appointment services versus 45.24% (19/42) in those without. General population target achievement rates were 29.31% (17/58) and 30.95% (13/42), respectively. Before adjusting for confounders, institutions providing appointment services had a 77% lower probability of contract fulfillment difficulties [OR: 0.23, 95%CI (0.07, 0.75); P=0.015]. After adjustment, the association remained significant [OR: 0.28, 95%CI (0.08, 0.98); P=0.047]. However, no statistically significant association was found between appointment service provision and low resident renewal rates (P>0.05).

Discussion and Recommendations

3.1 Discussion

This study, from the service provider perspective and using primary healthcare institutions as the research unit, quantitatively analyzed the impact of appointment-based medical services on contracted service outcome quality in Meizhou and Heyuan, Guangdong Province. The results demonstrate that the 2020 targets of 30% coverage for the general population and 60% for priority populations have been achieved, establishing a solid foundation for the 2025 goals of 50% and 80%, respectively. However, both cities face challenges with contract fulfillment and low renewal rates, with fulfillment difficulties being particularly severe. Notably, amid high contracting rates, implementing appointment-based medical services significantly reduces fulfillment difficulties. These findings can help optimize family physician contracting methods and provide evidence for improving service quality.

The family physician system establishes long-term, fixed relationships with residents through service agreements to provide comprehensive, continuous, effective, timely, and personalized health management and preventive services [14]. Contracting is the means, while the primary goal is delivering health management and preventive services to improve quality. This study defines quality in terms of outcome metrics, which are concrete and precisely measurable, making them widely applicable [15]. However, field investigations and previous research

[16, 17] indicate that some implementations focus solely on contracting rates while neglecting substantive post-contract medical care, resulting in "signed but not served" phenomena, prominent fulfillment and renewal difficulties, and superficial service delivery.

In the context of high contracting rates, appointment-based medical services significantly reduce fulfillment difficulties but do not significantly improve contracting rates for general or priority populations nor substantially enhance low renewal rates. Although limited research exists domestically and internationally on this topic, studies show that appointment flexibility and reduced waiting times are important preferences in primary care and family physician services [18, 19], with appointment services ranking among the top four demands [20]. Family physician responsibility systems featuring appointment-based outpatient services more effectively improve treatment compliance and community-based medical service delivery [21].

Appointment services reduce non-medical waiting times, increase patient satisfaction, alleviate outpatient "peak-valley" phenomena, and improve service quality [22, 23]. For community residents without geographic advantages, appointment services eliminate distance barriers and reduce financial and human resource expenditures. Moreover, appointment services through family physician channels are more targeted, enabling more rational and full utilization of medical resources [23]. Additionally, appointment methods—including verbal, telephone, online, and terminal-based scheduling—provide not only access channels but also communication conduits between physicians and patients, fostering close relationships for comprehensive, continuous, effective basic medical care, public health, and health management services. Ultimately, national encouragement of appointment services aims to improve consultation quality, enhance patient experiences, increase efficiency, respect healthcare workers' rights, and optimize resource utilization [23], thereby improving family physician service quality and achieving policy goals of community-based initial diagnosis, two-way referral, and tiered treatment.

This study has two main limitations. First, the quality indicators could be further refined. While our outcome metrics were determined through expert interviews and literature review, capturing the current status of major outcome quality indicators, there remains room for improvement. Second, the sample has substantial geographic limitations and insufficient sample size; future research should expand to multiple regions to improve coverage and representativeness.

3.2 Recommendations

To advance the Healthy China strategy, the National Health Commission's "2019 Medical Institution Capacity Building (Family Physician Clinical Service Capacity) Pilot Project Implementation Plan" and the 2021 National Primary Health Work Teleconference proposed requirements to shift healthcare focus downward, transfer resources to the grassroots level, and follow principles of "ensuring ba-

sics, strengthening primary care, and establishing mechanisms" to continuously improve primary medical care, public health, and family physician contracting capabilities. The "Internet+ Family Physician Contracting Service" model innovation reflects online redistribution of physician resources, supplements family physician capacity, and meets growing public health needs, aiming for the goal of "common diseases treated at township level, serious diseases at county level, and rapid online response for severe and complex conditions with smooth green channels for contracted services." Based on our findings regarding appointment services' impact on service quality, we propose the following recommendations to support Guangdong' s family physician contracting services.

First, maintain the advantage of high contracting rates by leveraging Internet+ platforms to popularize appointment-based visits and achieve "signed and served." As network technology develops, we can innovate appointment models to explore comprehensive scheduling methods acceptable to diverse populations while enriching appointment content to include light consultations and interactive channels between family physicians and contracted residents. This promotes mutual understanding, facilitates continuous health management, and enhances residents' initiative and sense of gain.

Second, improve primary care quality to increase residents'motivation to actively utilize services, achieving "served and renewed." Family physicians' attitudes, improved convenience, and service quality are important factors influencing renewal decisions [24-26]. Empowering communities through Internet+ platforms can improve physician efficiency, reduce institutional labor costs, and enable whole-process community health management, allowing physicians more time and energy for enhanced patient communication and improved effective service duration and quality.

In summary, Guangdong' s family physician renewal rates are closely related to appointment service provision. Government departments and primary healthcare institution managers can enhance residents' trust and motivation to utilize services by diversifying appointment forms and content, empowering through Internet+ platforms to "improve efficiency and quality," and injecting motivation for service provision and utilization from both physician and patient perspectives, thereby enabling sustained, safe, appropriate, and effective integrated healthcare and health management for contracted households.

Author Contributions

Qiru Zhou and Xin Cheng conceptualized and designed the study, analyzed and interpreted results, drafted and revised the manuscript. Chun Hao conducted feasibility analysis and quality control. Yonggang Wang, Rui Shen, and Minxian Zhu collected data. Jushuang Li organized data and performed statistical analysis. Xin Cheng provided overall supervision and management.

The authors declare no conflicts of interest.

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Table 1 Basic Characteristics of Township Health Centers (n=100)

Characteristic	Total (n=100)	Without Appointment Service (n=42)	With Appointment Service (n=58)	P-value
Per capita GDP (yuan)	18,081 (9,830, 28,823)	18,842 (12,062, 25,552)	15,787 (9,162, 28,890)	<0.001
Internet medical platform	66 (66.0%)	34 (81.0%)	32 (55.2%)	<0.001
Remote medical service	34 (34.0%)	16 (38.1%)	18 (31.0%)	0.482
Integrated health-care network member	48 (48.0%)	17 (40.5%)	31 (53.4%)	0.225
Standard family physician team	52 (52.0%)	25 (59.5%)	27 (46.6%)	0.301
Contracting channel types	4.0 (3.0, 5.0)	4.0 (3.0, 4.0)	4.0 (3.0, 5.0)	0.577
Basic medical service types	3.0 (2.0, 3.0)	2.0 (1.0, 2.0)	3.0 (3.0, 3.0)	<0.001

Characteristic	Total (n=100)	Without Appointment Service (n=42)	With Appointment Service (n=58)	P-value
Health management service types	4.0 (3.0, 5.0)	4.0 (3.0, 4.0)	5.0 (4.0, 5.0)	<0.001
Essential public health service types	14.0 (14.0, 14.0)	14.0 (14.0, 14.0)	14.0 (14.0, 14.0)	0.860
Priority population contracting rate target met	58 (58.0%)	23 (54.8%)	35 (60.3%)	0.860
General population contracting rate target met	42 (42.0%)	19 (45.2%)	23 (39.7%)	0.860
Contract fulfillment difficulties	78 (78.0%)	38 (90.5%)	40 (69.0%)	0.010
Low renewal rate	50 (50.0%)	24 (57.1%)	26 (44.8%)	0.272

Table 2 Contracting Coverage for Priority and General Populations

Population Type	Overall (n=100)	Meizhou (n=59)	Heyuan (n=41)
Priority population contracting rate (%)	69.0 (60.0, 85.0)	70.0 (60.0, 86.3)	65.0 (50.0, 80.5)

Population Type	Overall (n=100)	Meizhou (n=59)	Heyuan (n=41)
General population contracting rate (%)	31.8 (29.1, 54.5)	40.0 (30.0, 60.0)	30.0 (20.0, 35.4)

Table 3 Contract Fulfillment and Renewal Difficulties in Township Health Centers

Difficulty Type	Overall (n=100)	Meizhou (n=59)	Heyuan (n=41)
Contract fulfillment difficulties	78 (78.00%)	44 (74.58%)	34 (82.93%)
Low renewal rate	50 (50.00%)	28 (47.46%)	22 (53.66%)

Table 4 Impact of Appointment-Based Medical Services on Contract Fulfillment and Renewal

Outcome	Without Appointment Service (n=42)	With Appointment Service (n=58)	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Priority population target met (2025: 80%)	19 (45.24%)	23 (39.66%)	0.80 (0.36, 1.78)	0.577	0.61 (0.24, 1.56)	0.301
General population target met (2025: 50%)	13 (30.95%)	17 (29.31%)	0.93 (0.39, 2.20)	0.860	0.53 (0.17, 1.64)	0.272

Outcome	Without Appointment Service (n=42)	With Appointment Service (n=58)	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Contract fulfillment difficulties	38 (90.47%)	40 (68.97%)	0.23 (0.07, 0.75)	0.015	0.28 (0.08, 0.98)	0.047
Low renewal rate	18 (42.86%)	32 (55.17%)	1.64 (0.74, 3.66)	0.225	1.40 (0.55, 3.55)	0.482

Note: Adjusted for region, service population, per capita GDP, contracting channels, family physician team staffing, health management services, essential public health services, training, and integrated healthcare network membership.

Note: Figure translations are in progress. See original paper for figures.

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