

## Postprint: Influencing Factors and Mechanisms of Work Output Level of Family Doctor Teams from a Team Effectiveness Perspective

**Authors:** Chen Bihua, Lin Qiyi, Wuhua Li, Su Jin, Liping Tu, Lan Shi, Ding Xiaoqin, Yi Chuntao, Yi Chuntao

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### Abstract

**Background** Family doctor contract services constitute a key initiative for promoting tiered diagnosis and treatment. Team effectiveness represents a core antecedent influencing the performance of family doctor teams; however, the mechanisms through which its internal and external factors operate remain unclear, necessitating empirical investigation.

**Objective** To conduct an empirical study on family doctor team effectiveness and explore the influence mechanisms of internal and external factors on team effectiveness.

**Methods** From March to May 2024, a questionnaire survey was administered to members of family doctor teams at 20 community health service centers participating in the Shanghai public hospital high-quality development pilot program. The questionnaire encompassed personal basic characteristics, status of the family doctor team, Family Doctor Contract Service Team Effectiveness Evaluation Scale, Perceived Organizational Support Scale, and Family Doctor Team Leader Leadership Scale. The Family Doctor Contract Service Team Effectiveness Evaluation Scale, designed by the research team, comprised four subscales: human resource allocation, capacity reserve, team operation, and output execution. Univariate analysis and multiple linear regression analysis were employed to examine factors influencing the team output execution subscale score, while structural equation modeling was used to analyze the mechanisms through which internal and external team factors affect team output execution.

**Results** A total of 514 questionnaires were distributed, with 509 valid questionnaires recovered, yielding an effective response rate of 99.0%. The average score of the team output execution subscale was  $(3.99 \pm 0.76)$ . Univariate analysis revealed statistically significant differences in output execution subscale scores

among members of different ages and years of working as a family doctor/in general practice ( $P < 0.05$ ). Members from teams with different numbers of family doctors, different ratios of family doctors to family doctor assistants, and different levels of satisfaction with current family doctor team work showed statistically significant differences in output execution subscale scores ( $P < 0.05$ ). Statistically significant differences were also observed in output execution subscale scores among members from teams with versus without rehabilitation physicians, public health personnel, and third-party personnel ( $P < 0.05$ ). Multiple linear regression analysis indicated that team operation subscale score, perceived organizational support score, and team leader leadership score had positive effects on team output execution subscale score ( $P < 0.05$ ). Structural equation model results demonstrated that internal processual factors, external factors, and internal structural factors all positively drove team effectiveness output execution ( $P < 0.05$ ) in descending order of

## Full Text

### The Influencing Factors and Mechanisms of the Work Output Level of Family Doctor Teams from the Perspective of Team Effectiveness

CHEN Bihua<sup>1</sup>, LIN Qiyi<sup>1</sup>, LI Wuhua<sup>1</sup>, SU Jin<sup>1</sup>, TU Liping<sup>1</sup>, SHI Lan<sup>1</sup>, DING Xiaoqin<sup>1</sup>, YI Chuntao<sup>2\*</sup>

<sup>1</sup>Department of General Practice, Fenglin Street Community Health Service Center, Shanghai 200030, China

<sup>2</sup>Xuhui District Health Supervision Office, Shanghai 200030, China

*Corresponding author: YI Chuntao, Chief physician; E-mail: yict@163.com*

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## Abstract

**Background:** Family doctor contract services are a key measure to promote tiered diagnosis and treatment. Team effectiveness is the core antecedent affecting the performance of family doctor teams, yet the mechanisms of its internal and external factors remain unclear and require empirical exploration.

**Objective:** To conduct empirical research on family doctor team effectiveness and explore the mechanisms through which internal and external influencing factors affect team effectiveness.

**Methods:** From March to May 2024, we conducted a questionnaire survey of family doctor team members from 20 community health service centers participating in Shanghai's pilot program for high-quality development of public hospitals. The questionnaire included personal basic characteristics, team situation, Family Doctor Contract Service Team Effectiveness Evaluation Scale,

Perceived Organizational Support Scale, and Family Doctor Team Leader Leadership Scale. The Team Effectiveness Evaluation Scale, developed by our research group, comprised four subscales: human resource allocation, capability reserve, team operation, and output execution. Univariate analysis and multiple linear regression were used to explore influencing factors of the output execution subscale scores, while structural equation modeling was employed to analyze the mechanisms of internal and external factors on team output execution.

**Results:** A total of 514 questionnaires were distributed, with 509 valid questionnaires recovered (effective response rate: 99.0%). The average score of the team output execution subscale was  $(3.99 \pm 0.76)$ . Univariate analysis revealed statistically significant differences in output execution subscale scores among members of different ages and with different years of experience in family doctor/general practice work ( $P < 0.05$ ). Scores also differed significantly based on the number of family doctors in the team, the ratio of family doctors to family doctor assistants, and members' satisfaction with their current family doctor team work ( $P < 0.05$ ). Additionally, whether the team included rehabilitation physicians, public health personnel, or third-party personnel showed significant differences ( $P < 0.05$ ). Multiple linear regression analysis indicated that team operation subscale scores, perceived organizational support scores, and team leader leadership scores had positive effects on output execution subscale scores ( $P < 0.05$ ). Structural equation modeling revealed that internal process factors, external factors, and internal structural factors all positively drove team effectiveness output execution ( $P < 0.05$ ), with decreasing magnitude. External factors significantly and positively drove both internal process factors and internal structural factors ( $P < 0.001$ ), also with decreasing magnitude. Internal structural factors significantly and positively drove internal process factors ( $P < 0.001$ ).

**Conclusion:** Individual years of practice, number of doctors in the team, team personnel configuration, team capability reserve, team operation, perceived organizational support, and family doctor team leader leadership all influence the output execution level of team effectiveness. Team internal structural and process elements positively drive team effectiveness. We should rationally establish and configure family doctor teams, continuously improve team capabilities, and strengthen organizational support to enhance team effectiveness.

**Keywords:** Family doctor team; Task performance; Community health services; Team work outputs; Root cause analysis

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## Introduction

Family doctor contract services represent a crucial strategy for implementing tiered diagnosis and treatment, rationally utilizing medical resources, and safeguarding public health. In August 2022, the National Health Commission issued the "Guiding Opinions on Promoting High-Quality Development of Family Doc-

tor Contract Services” (National Health Commission Grassroots Development [2022] No. 10), calling for actively increasing the supply of family doctor contract services, expanding coverage, strengthening service connotations, and improving performance evaluation and incentive mechanisms. This marked a new era of high-quality development for family doctor contract services. Against this backdrop, encouraging family doctor teams to deliver effective services, improve performance, and leverage members’ subjective initiative has become a priority in community health service management and research.

The concept of team effectiveness was proposed by MCGRATH[1], with its core idea describing the key elements through which team members obtain valuable results and products through effective activities. Research in human resource management shows that team effectiveness influences members’ achievement-seeking patterns and determines the level of effort they exert. Higher team effectiveness is more conducive to successful task completion and improved performance. Some studies have defined family doctor team effectiveness based on the characteristics of Chinese family doctor teams as: the team’s ability to provide effective services, achieve expected goals, and realize sustainable development[2]. However, current quantitative research on the mechanisms of internal and external elements of team effectiveness remains insufficient.

Our research group previously developed a family doctor team effectiveness evaluation tool comprising 35 measurement items and four subscales, using the “input-process-output” framework against the backdrop of high-quality development policies for family doctor contract services[3-5]. This study further conducted empirical research using family doctor team members from 20 community health service centers identified in the “Notice on Launching the Pilot Work for High-Quality Development of Public Hospitals in Shanghai” issued by the Shanghai Municipal Health Commission in October 2022 (hereinafter referred to as the “Notice” ). We explored the internal and external influencing factors of family doctor team effectiveness and analyzed the mechanisms through which key variables such as contract service volume and organizational support affect team effectiveness, providing evidence for further improving family doctor team service effectiveness and promoting expanded coverage and strengthened service connotations.

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## 1. Subjects and Methods

**1.1 Study Subjects** From March to May 2024, we used purposive sampling to include all family doctor team members from the 20 pilot community health service centers specified in the “Notice.” Inclusion criteria were: (1) engaged in family doctor contract services or management work, including team doctors, nurses, and public health physicians; (2) employed and on duty during the survey period; and (3) signed informed consent and voluntarily participated. Exclusion criteria were: (1) rotating or temporarily assigned personnel; and (2) inability

to participate due to being away or unable to complete the questionnaire using a smartphone. This study was approved by the Shanghai Clinical Research Ethics Committee (Approval No.: SECCR/2023-33-01).

**1.2 Questionnaire Design** Based on literature review and our group's preliminary research, we designed the survey questionnaire comprising: (1) Personal basic characteristics: gender, age, education level, years of experience in family doctor/general practice work, type of community health service center, and job category. (2) Team situation: average number of contracted residents per team doctor, number of family doctors in the team, and satisfaction with current family doctor team work. (3) Family Doctor Contract Service Team Effectiveness Evaluation Scale: developed in our preliminary research, containing 35 items across four subscales, all using a 7-point Likert scale ("strongly disagree" to "strongly agree," scored 1-7). Higher scores indicated greater agreement with the effectiveness item. The human resource allocation subscale (7 items) measured whether staffing numbers and categories were sufficient for team effectiveness. The capability reserve subscale (5 items) measured whether the team possessed adequate service capabilities (including team leader capabilities) to support high effectiveness. The team operation subscale (18 items) measured whether the team had sound operational and task response mechanisms and effectively managed contracted residents. The output execution subscale (5 items) measured team members' recognition and satisfaction with team performance and continuous effectiveness improvement. (4) Perceived Organizational Support Scale: using the nurse organizational support scale developed by WANG Haocen et al.[6] with 15 items and a 5-point Likert scale. Reported content validity index was 0.940 and Cronbach's  $\alpha$  was 0.953. We adapted some items to the family doctor team context. In this study, Cronbach's  $\alpha$  was 0.991 and split-half reliability was 0.970. (5) Family Doctor Team Leader Leadership Scale: using the clinical leadership scale developed by LI Quan et al.[7] with 15 items and a 5-point Likert scale. Reported content validity index was 1.000 and Cronbach's  $\alpha$  was 0.942.

**1.3 Survey Method** After training surveyors on the research background and questionnaire requirements, surveyors contacted leaders of the 20 community health service centers. Upon obtaining consent, they distributed the questionnaire through the "Wenjuanxing" platform as an online survey. Quality control was implemented by setting questionnaires with completion time <5 minutes or with 10 consecutive identical responses as invalid. The survey followed principles of anonymity, confidentiality, and voluntary participation. A total of 514 questionnaires were collected, with 509 valid questionnaires retained after excluding invalid responses, yielding an effective rate of 99.0%.

**1.4 Statistical Analysis** Data were entered using Excel 2019 and analyzed using SPSS 26.0. Cronbach's  $\alpha$  and split-half coefficients were calculated for the Family Doctor Contract Service Team Effectiveness Evaluation Scale, Perceived

Organizational Support Scale, and Team Leader Leadership Scale to assess internal consistency, with Cronbach's  $\alpha \geq 0.70$  considered acceptable[8]. KMO test and Bartlett's sphericity test were used to assess factor analysis suitability, with KMO  $> 0.70$  and Bartlett's test  $P < 0.05$  considered suitable[9-10]. Normally distributed continuous data were expressed as  $(\bar{x} \pm s)$ , and categorical data as frequencies. Descriptive statistics were performed. Two-group comparisons used t-tests, and multi-group comparisons used one-way ANOVA.  $P < 0.05$  was considered statistically significant.

Based on the definition of team effectiveness, the ultimate goals of human resource allocation, capability reserve, and team operation within a team are to enhance team productivity, generate synergy, and improve team output execution. Therefore, aligning with the concept of team effectiveness and our research objectives, we used the output execution subscale score as the dependent variable to explore how internal and external factors of team effectiveness influence output execution and thereby reveal the mechanisms. We conducted combined analyses: univariate and multiple linear regression analyses for influencing factors of team effectiveness output execution; and structural equation modeling using AMOS 26.0 to analyze the mechanisms, with model fit considered acceptable when CMIN/DF  $< 5.000$ , RMSEA  $< 0.080$ , NFI  $> 0.900$ , RFI  $> 0.900$ , IFI  $> 0.900$ , TLI  $> 0.900$ , CFI  $> 0.900$ , and PNFI  $> 0.500$ [11].

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## 2. Results

**2.1 Basic Characteristics of Respondents** Among the 509 family doctor team members, 140 (27.5%) were male and 369 (72.5%) were female. The majority were aged 31-50 years (420, 82.5%). Most had bachelor's degrees (408, 80.2%). Years of experience in family doctor/general practice work were  $< 10$  years for 227 (44.6%), 11-20 years for 164 (32.2%), and 21-30 years for 118 (23.2%). Community health service centers were located in urban areas for 281 (55.2%), urban-suburban interface areas for 184 (36.2%), and suburban areas for 44 (8.6%). Job categories included team leaders (92, 18.1%) and general practitioners (343, 67.4%).

The average number of contracted residents per team doctor was \$ \$1,500 for 312 (61.3%). Most teams had 3-6 family doctors (337, 66.2%). Teams included rehabilitation physicians (244, 47.9%), traditional Chinese medicine practitioners (427, 83.9%), clinical pharmacists (430, 84.5%), public health personnel (385, 75.6%), and third-party personnel (239, 47.0%). Most members were satisfied or very satisfied with their current family doctor team work (373, 73.3%).

**2.2 Scale Scores and Reliability/Validity** The Perceived Organizational Support Scale had a mean score of  $(3.95 \pm \$0.78)$ , Cronbach's  $\alpha$  of 0.991, and split-half coefficient of 0.970. The Team Leader Leadership Scale had a mean score of  $(3.99 \pm \$0.79)$ , Cronbach's  $\alpha$  of 0.995, and split-half

coefficient of 0.985. The overall Family Doctor Contract Service Team Effectiveness Evaluation Scale had a mean score of  $(3.83 \pm 0.74)$ . *Subscale scores were: human resource allocation*  $(3.45 \pm 0.93)$ , *capability reserve*  $(3.93 \pm 0.78)$ , *team operation*  $(3.96 \pm 0.76)$ , and *output execution*. The total scale Cronbach's  $\alpha$  was 0.985 and split-half coefficient was 0.943.

### 2.3 Analysis of Influencing Factors of Family Doctor Team Effectiveness

**(1) Individual factors:** No statistically significant differences in output execution subscale scores were found by gender, education level, type of community health service center, or job category ( $P > 0.05$ ). However, significant differences were found by age and years of experience in family doctor/general practice work ( $P < 0.05$ ).

**(2) Team structure:** No significant differences were found based on the average number of contracted residents per team doctor, or whether the team included traditional Chinese medicine practitioners or clinical pharmacists ( $P > 0.05$ ). Significant differences were found based on the number of family doctors in the team, the ratio of family doctors to family doctor assistants, satisfaction with current team work, and whether the team included rehabilitation physicians, public health personnel, or third-party personnel ( $P < 0.05$ ).

**(3) Multiple linear regression analysis:** Using the output execution subscale score as the dependent variable and human resource allocation, capability reserve, and team operation subscale scores as independent variables, the results showed that team operation subscale score significantly influenced output execution subscale score ( $P < 0.05$ ).

**(4) Multiple linear regression analysis:** Using the output execution subscale score as the dependent variable and perceived organizational support and team leader leadership scores as independent variables, the results showed that both perceived organizational support and team leader leadership scores significantly influenced output execution subscale score ( $P < 0.05$ ).

### 2.4 Structural Equation Model Analysis of Team Output Execution Mechanisms

Integrating the above findings, we constructed a structural equation model. Based on the specific connotations of each factor, the mechanism of team effectiveness output execution was divided into four components: (1) External factors, including perceived organizational support, team leader leadership, average number of contracted residents per team doctor, and number of family doctors (4 factors); (2) Internal structural factors, including human resource allocation and capability reserve (2 factors, 12 items); (3) Internal process factors (intermediate variables), including team operation (1 factor, 18 items); and (4) Output results (output execution), including team output execution (1 factor, 5 items).

Reliability and validity analyses of external factors showed: Cronbach's  $\alpha = 0.817$ , KMO = 0.809, Bartlett's sphericity test  $P < 0.001$ . For internal structural factors, internal process factors, and output results, Cronbach's  $\alpha$  coefficients

were 0.822, 0.986, and 0.974; KMO values were 0.823, 0.967, and 0.907; and Bartlett's sphericity tests were all  $P < 0.001$ , indicating suitability for factor analysis.

The structural equation model showed good fit:  $CMIN/DF = 3.718$ ,  $RMSEA = 0.065$ ,  $NFI = 0.933$ ,  $RFI = 0.901$ ,  $IFI = 0.916$ ,  $TLI = 0.922$ ,  $CFI = 0.929$ ,  $PNFI = 0.665$  [Figure 1: see original paper].

The structural equation model revealed: internal process factors, external factors, and internal structural factors significantly and positively drove output execution ( $P < 0.001$ ), with path coefficients of 0.562, 0.522, and 0.501, respectively, showing decreasing magnitude. External factors significantly and positively drove both internal process factors and internal structural factors ( $P < 0.001$ ), with path coefficients of 0.571 and 0.514, respectively, also showing decreasing magnitude. Internal structural factors significantly and positively drove internal process factors ( $P < 0.001$ ), with a path coefficient of 0.576 .

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## Discussion

Teams have become the primary unit for accomplishing goal-oriented tasks in modern organizations, with related research literature growing exponentially over the past two decades. Studies on team productivity and effectiveness have become particularly prominent in human resource management. MATHIEU et al.[12] and HOU Jin[13] noted in their reviews that team effectiveness is one of the most important antecedent variables for improving team performance. MCGRATH's[1] "input-process-output" (IPO) theoretical model provides an excellent framework for formally measuring team effectiveness.

Analysis of influencing factors on team effectiveness output execution showed that at the individual level, age and years of experience in family doctor/general practice work affected output execution. Members aged 26-30 had the highest average output execution score of 4.49, likely due to their strong physical energy, vitality, and learning ability, enabling rapid adaptation to new policies and team atmosphere. In contrast, members aged 36-40 had an average score of only 3.75, possibly because this group needs to allocate more time to childcare and eldercare responsibilities. This suggests that around ages 30-35 may represent a "watershed" moment for family doctors and team members, requiring focused attention on their effectiveness. Additionally, those with 11-20 years of experience had a relatively high average output execution score of 4.12, further supporting this observation.

At the team structure level, whether the team included rehabilitation physicians, public health personnel, or third-party personnel, the total number of family doctors, and the ratio of family doctors to family doctor assistants all affected output execution scores. Currently, disabled individuals and those in disease recovery periods have been designated as priority groups for family doc-

tor contract services[14]. Integrating rehabilitation physicians and therapists into team services helps precisely match residents' needs[15], thereby improving rehabilitation service levels and overall team effectiveness. Against the backdrop of "medical-preventive integration" [16], public health personnel strengthen disease prevention and control, improving residents' health. When the ratio of family doctors to family doctor assistants was 1:1.0 to >1:1.2, the average team output execution score reached 4.41. Existing practice shows that 配备 family doctor assistants helps strengthen the hospital-community-family service connection[17], improving team effectiveness from multiple dimensions. Considering these findings, a diverse team structure with 3-6 general practitioners as the core, supplemented by rehabilitation, public health, and third-party personnel, and equipped with adequate assistant staff, may yield better execution output efficiency, providing reference for future team building.

Integrating all elements and constructing a structural equation model revealed that internal process factors, external factors, and internal structural factors all significantly and positively drove output execution. Among these, internal process factors had the strongest driving effect, indicating that cohesion, healthy competition mechanisms, member responsibility, task fluency, and communication mechanisms during team operation are core elements driving team effectiveness improvement. Therefore, guiding family doctor teams to form smooth work processes and continuously enhance team cohesion and task completion efficiency should remain the primary focus for improving service effectiveness. Domestic and international studies show that interdisciplinary team building and encouraging internal and external communication[18-19] can effectively promote service model transformation and effectiveness upgrading, consistent with our findings.

Further analysis revealed that organizational support and leadership in external factors not only drove team output execution but also positively influenced internal structural factors. Research shows that perceived organizational support and strong team leadership enhance members' sense of belonging and trust, improve work enthusiasm and initiative, promote team learning and development, and reduce member stress and anxiety[20-21]. Combined with our findings, this suggests that external influencing factors can improve team internal operational efficiency and enable higher effectiveness by providing organizational support and strengthening leadership capabilities. Therefore, from an external perspective, future strategies for improving family doctor team effectiveness should: (1) provide various hardware and software support at the community health service center level to ensure members genuinely feel organizational care and attention; and (2) emphasize team leader leadership capacity building to enhance family doctor teams' effectiveness in achieving goals.

At the internal structural element level, human resource allocation and capability reserve positively influenced both team output execution and internal process factors. Research indicates that optimized team staffing helps stimulate member potential, enhance teamwork and communication, and improve team

effectiveness and productivity. Moreover, solid professional knowledge and skills are necessary conditions and guarantees for family doctors to perform their work and are prerequisites for team effectiveness and output execution. Good human resource allocation and capability reserve can improve overall team collaboration and job competency, thereby enhancing output execution by improving team operation quality.

Overall, the structural equation model of family doctor team effectiveness output execution presents a progressive mechanism of “external factors → internal structure → internal process → output execution.” That is, providing sufficient external support at the institutional level is the cornerstone for ensuring robust team structure and adequate capability reserve. By optimizing internal team structure, we can effectively drive continuous improvement in internal operation levels, ultimately achieving the goal of improving team effectiveness output. Our findings are not only compatible with team effectiveness theories and practical experience but also align with the policy orientation of China’s family doctor contract services[22], providing theoretical support for community health service management departments to formulate strategies for promoting high-quality development of family doctor contract services.

This study has several limitations. First, due to time and resource constraints, we used purposive sampling to select 20 high-quality development pilot community health service centers in Shanghai. The basic conditions, resource investment, and management levels of these institutions may be superior to non-pilot institutions, potentially causing selection bias. Caution is needed when generalizing conclusions to other regions or ordinary community health service centers. Second, core variables such as team effectiveness and perceived organizational support were measured using self-reported scales, which may involve common method bias and social desirability bias despite reliability and validity testing. Cross-sectional data also limit rigorous causal inference. Third, our structural equation model only verified preset path relationships, 未能纳入 all potential influencing factors such as residents’ health status and external competitive environment, and the mediating mechanisms among latent variables require further verification through longitudinal studies or experimental designs. Fourth, this study focused on team-level mechanisms and has not deeply explored cross-level interactions between individual characteristics (such as personality and motivation) and team-level factors. Future research should conduct multi-center, large-sample longitudinal studies combining objective performance data and qualitative interviews to more comprehensively and dynamically reveal the development trajectory and mechanisms of family doctor team effectiveness.

## Conclusions and Recommendations

Based on empirical analysis of the mechanisms of family doctor team effectiveness, this study systematically explored influencing factors and pathways of team effectiveness output execution. We propose the following optimization recommendations:

- 1. Rationally optimize family doctor team member configuration.**  
Based on the geographic and demographic characteristics and health needs of the service area, establish appropriately sized, diversified family doctor teams comprising community health professionals and social forces. Prioritize recruiting young and middle-aged physicians for contract services while focusing on the psychological status and career aspirations of physicians with approximately 10 years of practice, providing targeted support. Reasonably increase the proportion of rehabilitation physicians, public health personnel, third-party personnel, and family doctor assistants in teams, promoting deep integration of various personnel into contract services to further optimize team structure.
- 2. Continuously conduct health service capability training and strengthen family doctor team leader leadership development.**  
Enrich training forms for team members through specialized general practice training, teaching rounds, mini-lectures, “three basics” training and assessment, policy interpretation, and continuing education to enhance professional knowledge and practical skills, thereby strengthening capability reserves. Additionally, emphasize team leaders’ leadership and communication skills. Improve team leader selection mechanisms through regular appointment and competitive selection processes. Establish clear communication channels and standardized workflows at institutional and team levels, encouraging members to express opinions and provide timely feedback to teams and management agencies to ensure smooth and efficient contract service workflows.
- 3. Provide organizational-level support and necessary resources to ensure team operation.** Community health service center management should establish and improve performance evaluation and incentive mechanisms for family doctor teams, focusing on health management service quality and medical expenditure control efficiency to develop scientific reward and punishment methods. Provide professional support and resource guarantees from other internal departments, such as collaborative services with joint wards, physical examination centers, traditional Chinese medicine, otolaryngology, and rehabilitation departments, to assist teams in optimizing workflows and building continuous health service models for residents. Improve internal coordination mechanisms, strengthen organizational culture construction, and create a respectful, trusting, and inclusive work atmosphere to enhance team members’ perceived organizational support, thereby comprehensively improving family doctor team

work effectiveness and service performance.

**Author Contributions:** CHEN Bihua was responsible for drafting and revising the manuscript; LIN Qiyi, LI Wuhua, SU Jin, and TU Liping were responsible for data collection and quality control; SHI Lan and DING Xiaoqin provided support for statistical analysis; YI Chuntao had overall responsibility for study design, implementation, and interpretation of results.

**Conflict of Interest:** The authors declare no conflicts of interest.

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