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The Influence Path of the Homogenization Management Level of Medical Services in County-level Medical Communities on the Medical Service Capabilities of Township Health Centers

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The Influence Path of the Homogenization Management Level of Medical Services in County-level Medical Communities on the Medical Service Capabilities of Township Health Centers

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Abstract

Objective: This study elucidates the relationship between the level of homogeneity management in county-level community healthcare services and the medical service capacity of township health centers. and constructs an influence path model. It aims to promote the coordinated development of county-level medical and health undertakings and further achieve the goal of high-quality development of county-level medical communities.

Methods: Based on literature research, an evaluation system for homogenization management level of medical services in county-level medical communities was built by expert consultation, with weights determined by AHP. Entropy weight-TOPSIS and WRSR were combined to evaluate homogenization management and service capabilities. Questionnaire data were tested by descriptive, reliability and factor analyses, and SEM verified the influence path.

Results: An indicator system for homogenization management (4 first-level, 10 second-level, 24 third-level indicators) and service capabilities (4 first-level, 8 second-level, 29 third-level indicators) were constructed. 646 valid questionnaires were collected; both questionnaires had good reliability (Cronbach's alpha 0.962, 0.939) and validity. SEM showed homogenization management significantly affected service capabilities (β=0.649, P<0.001), with influence order: business management > basic medical care > resource allocation > comprehensive management.

Conclusion: There are differences in homogenization management and service capabilities among 4 sample county-level medical communities. Improving homogenization management via system construction, unified standards, talent optimization and information construction can boost township health centers' service capabilities and promote high-quality development.

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Key words: County-level medical community; Homogenization management level of medical se rvices; Medical service capabilities of township health centers; Influence path

1 Background

Under the background of deepening medical reform, the construction of medical alliances is an important institutional innovation, whose core lies in optimizing the allocation of medical resources. By promoting the shift of the focus of the medical and health service system downwards and the sinking of resources, the medical alliance model effectively improves grassroots service capabilities. At the same time, this model enhances the overall efficiency of the medical service system through vertical integration of medical resources, provides important support for the implementation of the hierarchical diagnosis and treatment system, and thus better meets the diverse health needs of the masses.

In December 2016, the National Health and Family Planning Commission issued the "Guiding Opinions on Carrying out Pilot Work on the Construction of Medical Alliances" to guide local governments in carrying out pilot work on medical alliance construction and promote the establishment of an orderly hierarchical diagnosis and treatment model [1]. In April 2017, the General Office of the State Council issued the "Guiding Opinions on Promoting the Construction and Development of Medical Alliances", clearly proposing four medical alliance organizational models and their respective functional orientations: urban medical groups, county-level medical communities, cross-regional specialist alliances, and remote medical collaboration networks in remote and poor areas [2]. In May 2019, the National Health Commission issued the "Notice on Promoting the Construction of Compact County-level Medical and Health Communities", emphasizing that through the construction of compact county-level medical and health communities, we should accelerate the improvement of grassroots medical service capabilities, gradually build a new type of county-level medical and health service system with clear goals, clear powers and responsibilities, and division of labor and cooperation, gradually form a community of services, responsibilities, interests, and management, and gradually realize the homogenization of medical quality within the medical community [3]. In July 2020, the National Health Commission issued the "Measures for the Administration of Medical Alliances (Trial)", further clarifying the construction standards for medical alliances, and emphasizing that all medical and health institutions within the medical alliance should provide homogenized services, realize the homogenized management of medical quality, and improve the homogenization level of medical quality and services in the region [4]. In December 2023, the National Health Commission issued the "Guiding

Opinions on Fully Promoting the Construction of Compact County-level Medical and Health Communities", pointing out that in accordance with the development requirements of compactness and homogenization, we should highlight the result-oriented approach of continuously improving the proportion of diagnosis and treatment volume in rural areas and improve the monitoring and evaluation indicator system for the construction of county-level medical communities [5].

The important value of medical alliances in the medical field is mainly reflected in their ability to effectively integrate medical resources. Through the sinking of high-quality resources, grassroots medical institutions can obtain high-level medical assistance, thereby ensuring that patients can receive standardized and homogenized medical services at all levels of medical institutions [6]. However, if the homogenization of medical services and quality cannot be achieved within the medical alliance, it will not only be difficult to meet the growing health needs of the people, but also may exacerbate the phenomenon of patients concentrating in high-level hospitals, forming a "siphon effect", and ultimately affecting medical order and diagnosis and treatment efficiency [7]. From this perspective, the homogenization of medical services is not only an inevitable requirement for the optimal allocation of medical resources, but also an inherent demand for the coordinated development of regional medical care. It is highly consistent with the key tasks of medical reform such as improving grassroots service capabilities, promoting hierarchical diagnosis and treatment, and deepening the construction of medical alliances. It is worth noting that achieving the homogenization of medical services is a systematic project that requires the establishment of a standardized system covering the entire process of diagnosis and treatment. Although the academic community has recognized the importance of promoting the construction of medical service homogenization within medical alliances, there are still deficiencies in constructing a scientific and quantitative homogenization management evaluation system. Therefore, exploring and establishing a comprehensive and objective evaluation indicator system for medical service homogenization management is of great theoretical and practical significance for promoting the high-quality development of medical alliances.

As a key node in the three-level rural medical and health service system, the medical service capabilities and quality level of township health centers are directly related to the overall development effect of grassroots medical and health undertakings. Despite the initial improvement of China's county-

level medical and health service system under the policy orientation of "strengthening grassroots", there are still many challenges: the unbalanced allocation of county-level medical resources, the prominent siphon effect of county-level medical institutions on grassroots patients, and the weakening of the basic medical functions of township health centers are issues that need to be addressed urgently [8]. Many scholars agree with the positive role of county-level medical and health communities (hereinafter referred to as county-level medical communities) in improving grassroots medical service capabilities [9], but the influence path between the homogenization management level of medical services in county-level medical communities and the medical service capabilities of township health centers still needs further exploration and verification.

Based on the above background, this study focuses on three core issues: first, the implementation status and level evaluation of the homogenization management of medical services in county-level medical communities; second, the current characteristics and development trends of the medical service capabilities of township health centers under the background of medical community construction; third, the influence path of the improvement of the homogenization management level of medical services in county-level medical communities on the medical service capabilities of township health centers? To address these issues, this study constructs an evaluation indicator system for the homogenization management level of medical services in county-level medical communities through the integration of policy texts and literature data, and conducts empirical tests. By integrating the existing evaluation system of grassroots medical service capabilities, this study deeply analyzes the mechanism of the homogenization management of medical services in county-level medical communities on the service capabilities of township health centers, in order to provide ideas and reference for the effective and reasonable allocation of resources within the county, the improvement of medical service quality, the construction of the hierarchical diagnosis and treatment system, and related research.

2 Materials

2.1 Data Sources

2.1.1 Domestic and Foreign Literature

This study conducts a systematic literature search through Chinese and English databases such as CNKI, Wanfang Data Knowledge Service Platform, VIP Chinese Journal Service Platform, Web of Science, and PubMed, using keywords such as "medical alliance", "medical community", "homogenization", "Hospital group", and "Integrated medical services" to comprehensively collect relevant research results.

2.1.2 Institutional Questionnaire Data

① "Institutional Questionnaire on the Homogenization Management Level of Medical Services in County-level Medical Communities" (see Additional File 1 for details): The data is collected through on-site filling or electronic form feedback from the leading units of county-level medical communities, including the scoring data of medical service homogenization management in four dimensions: system arrangement, diagnostic and treatment behaviors, talent flow, and information construction during 2020-2023.

② "Institutional Questionnaire on the Medical Service Capabilities of Township Health Centers" (see Additional File 2 for details): The data is collected through on-site filling or electronic form feedback from all township health center member units within the medical community, including indicator data on the medical service capabilities of township health centers in eight aspects: equipment and facilities, staffing, outpatient and emergency services, inpatient services, referral services, service efficiency, medical quality, and financial management during 2020-2023.

2.1.3 Questionnaire Data

The questionnaire data is collected through on-site surveys of medical staff in township health center member units, using a combination of offline filling and the Wenjuanxing platform. Based on the indicator evaluation system and the content of the institutional questionnaire, the Likert 5-point scale method is adopted as the measurement scale for the questionnaire items, and the "Questionnaire on the Implementation of Homogenization Management of Medical Services and Medical Service Capabilities in County-level Medical Communities" (see Additional File 3 for details) is designed. The questionnaire includes three parts: ① Basic information: gender, age, marital status, highest education,

job position, department, length of service, professional title, monthly income, and labor relations; ② The actual implementation of the homogenization management of medical services in county-level medical communities in our hospital: system arrangement, diagnostic and treatment behaviors, talent flow, and information construction; ③ The current situation of medical service capabilities in our hospital: resource allocation, basic medical care, business management, and comprehensive management.

2.2 Research Objects

Based on the actual promotion of county-level medical communities in Fujian Province and combined with expert consultation opinions, this study adopts the purposive sampling method to select 4 county-level medical communities in 3 prefecture-level cities as the research sites, and conducts on-site surveys on their medical service homogenization management level and the medical service capabilities of township health centers. The survey period is from May 2024 to October 2024.

2.2.1 Respondents of Institutional Questionnaires

The study collects the "Institutional Questionnaire on the Homogenization Management Level of Medical Services in County-level Medical Communities" by medical community, and takes all township health center member units within the medical community as the research objects to collect the "Institutional Questionnaire on the Medical Service Capabilities of Township Health Centers". Finally, 4 copies of the "Institutional Questionnaire on the Homogenization Management Level of Medical Services in County-level Medical Communities" and 43 copies of the "Institutional Questionnaire on the Medical Service Capabilities of Township Health Centers" are collected, including 10 from Nanjing County, Zhangzhou City; 13 from Zhao'an County, Zhangzhou City; 11 from Yong'an City, Sanming City; and 9 from Zhenghe County, Nanping City.

2.2.2 Respondents of Questionnaires

The study uses a self-designed questionnaire to conduct surveys on medical staff of 43 township health centers in 4 medical communities. It is planned to randomly select 20 medical staff familiar with the institutional situation from each township health center to conduct the questionnaire survey, so as to ensure that the data can comprehensively reflect the actual implementation of the homogenization

management of medical services in county-level medical communities in township health centers and their current medical service capabilities. Finally, a total of 646 valid copies of the "Questionnaire on the Implementation of Homogenization Management of Medical Services and Medical Service Capabilities in County-level Medical Communities" are recovered.

3 Results

3.1 Evaluation of the Homogenization Level of County-level Medical Communities

3.1.1 Construction of the Indicator System

This study adopted the expert consultation method [10]. Experts were provided with detailed explanations of the research purpose, significance, and content. Through the analysis of experts' basic information and communication with them, it was ensured that experts had a full understanding of the construction process of the evaluation indicator system for the homogenization management of medical services in county-level medical communities. After two rounds of expert consultations, expert opinions gradually converged, and an evaluation system consisting of 4 first-level indicators, 10 second-level indicators, and 24 third-level indicators was finally constructed. The specific indicators of this system are shown in Table 1.

Table 1 County Medical Community Homogenization Evaluation System

First-level Indicators	Second-level Indicators	Third-level Indicators
1. System Arrangement	1.1 Organizational Structure	1.1.1 Medical Quality Management Department
		1.1.2 Comprehensive Quality Inspection Team
	1.2 System Specifications	1.2.1 Core Medical Systems
		1.2.2 Diagnosis and Treatment Norms and Standards
	1.3 Performance and Remuneration	1.3.1 Assessment System
		1.3.2 Distribution Plan
2. Diagnosis and Treatment Behaviors	2.1 Medical Record Writing	2.1.1 Regular Training
		2.1.2 Quality Control Standards
		2.1.3 Regular Monitoring
	2.2 Diagnosis and Treatment	2.2.1 Regular Training
		2.2.2 Normative Standards
		2.2.3 Regular Assessment
	2.3 Routine Nursing	2.3.1 Regular Training
		2.3.2 Normative Standards
		2.3.3 Regular Assessment
3. Talent Flow	3.1 Expert Outpatient Service	3.1.1 Regular Expert Outpatient Service
		3.1.2 Expert Stationed Assistance
	3.2 Grassroots Further Study	3.2.1 Short-term Training
		3.2.2 Long-term Further Study
4. Information Construction	4.1 Health Information Platform	4.1.1 Primary Health Information System (PHIS)
		4.1.2 Regional Health Information Platform Based on Electronic Health Records
		4.1.3 Electronic Medical Record System (EMR)
		4.1.4 Clinical Information System (CIS)
	4.2 Resource Sharing	4.2.1 Construction of Resource Sharing Center
		4.2.2 Application of Resource Sharing Center

3.1.2 Empirical Research

3.1.2.1 Entropy Weight-TOPSIS Method

(1) Standardization of Indicators

All evaluation indicators for the homogenization management level of medical services in county-level medical communities involved in this study are positive indicators. Therefore, the range method ($X'_{ij} = \frac{X_j - X_{min}}{X_{max} - X_{min}}$) was used for the standardization of indicator values. After calculation, the standardized score matrix of each indicator in each region is shown in Table 2.

Table 2 Standardized Scores for Each Indicator Across Regions

Indicators	Nanjing County	Zhao'an County	Yong'an City	Zhenghe County
A1	0.429	0.000	1.000	1.000
A2	1.000	0.000	1.000	1.000
A3	1.000	0.000	1.000	1.000
A4	0.429	0.000	1.000	0.429
A5	1.000	0.000	0.571	0.429
A6	1.000	0.000	0.429	0.429
B1	0.000	0.125	0.750	1.000
B2	0.429	0.000	1.000	1.000
B3	0.000	0.125	1.000	1.000
B4	1.000	0.125	0.000	1.000
B5	0.000	0.125	1.000	0.500
B6	1.000	0.000	0.429	0.429
B7	0.000	0.125	1.000	1.000
B8	0.429	0.000	1.000	0.429
B9	1.000	0.000	0.429	1.000
C1	1.000	1.000	1.000	0.000
C2	1.000	0.000	0.000	0.000
C3	1.000	1.000	0.000	1.000
C4	1.000	0.000	1.000	1.000
D1	1.000	1.000	1.000	1.000
D2	0.000	1.000	1.000	1.000
D3	1.000	0.000	0.500	0.000
D4	1.000	0.000	1.000	1.000
D5	0.000	1.000	1.000	1.000
D6	1.000	1.000	1.000	0.000

(2) Indicator Weights, Optimal Vector, and Worst Vector

The entropy weight method was used to calculate the weight W of each indicator, forming a weighted standardized matrix, and the optimal solution P+ and worst solution P- were determined, as shown in Table 3.

Table 3 Weight, Optimal Vector, and Worst Vector for Normalized Indicators

Indicators	W	P+	P-
A1	0.034	0.034	0.000
A2	0.028	0.028	0.000
A3	0.028	0.028	0.000
A4	0.037	0.037	0.000
A5	0.035	0.035	0.000
A6	0.037	0.037	0.000
B1	0.049	0.049	0.000
B2	0.034	0.034	0.000
B3	0.050	0.050	0.000
B4	0.050	0.050	0.000
B5	0.052	0.052	0.000
B6	0.037	0.037	0.000
B7	0.050	0.050	0.000
B8	0.037	0.037	0.000
B9	0.034	0.034	0.000
C1	0.028	0.028	0.000
C2	0.136	0.136	0.000
C3	0.028	0.028	0.000
C4	0.028	0.028	0.000
D1	0.000	0.000	0.000
D2	0.028	0.028	0.000
D3	0.074	0.074	0.000
D4	0.028	0.028	0.000
D5	0.028	0.028	0.000
D6	0.028	0.028	0.000

(3) Euclidean Distance and Proximity Degree

According to the above formulas, the weighted Euclidean distances T+ and T- between the indicator values of each region and the optimal vector and worst vector were calculated respectively. Based on these distance values, the proximity degree $\boldsymbol{C_i}$ between each region and the optimal solution

was further calculated. The closer the value is to 1, the higher the similarity between the region and the optimal solution; on the contrary, the closer the value is to 0, the greater the difference from the optimal solution. The calculation results show that the ranking of the average homogenization management levels of county-level medical communities in various regions from 2020 to 2023 using the entropy weight-TOPSIS comprehensive evaluation method is: Nanjing County > Yong'an City > Zhenghe County > Zhao'an County.

3.1.2.2 WRSR Method

After ranking each indicator, the WRSR of the average homogenization management level of county-level medical communities in each region was calculated and ranked. The results show that the ranking of the average homogenization management levels of county-level medical communities in various regions from 2020 to 2023 using the WRSR comprehensive evaluation method is: Yong'an City > Nanjing County > Zhenghe County > Zhao'an County.

3.1.2.3 Fuzzy Combination Method of Entropy Weight-TOPSIS and WRSR

The results show that using the fuzzy combination method of entropy weight-TOPSIS and WRSR [11], the ranking of the average homogenization management levels of county-level medical communities in various regions from 2020 to 2023 is: Nanjing County > Yong'an City > Zhenghe County > Zhao'an County.

3.2 Evaluation of the Service Capacity of Township Health Centers

3.2.1 Construction of the Indicator System

This study initially formed a candidate indicator pool by referring to the Guidelines for Evaluating the Service Capacity of Township Health Centers (2023 Edition), the Statistical Analysis Indicator Set for National Hospital Reporting Data (Trial), and relevant literature. On this basis, combined with expert consultation opinions, the candidate indicators were screened and optimized, and the evaluation indicator system for the medical service capacity of township health centers was finally determined, as shown in Table 4.

Table 4 Indicator System for Evaluating the Medical Service Capacity of Township Health Centers

First-level Indicators	Second-level Indicators	Third-level Indicators
Resource Allocation	Facilities and Equipment	A1 Building Area (m²)
		A2 Number of Beds per 1,000 Permanent Residents (beds)
		A3 Number of Actually Open Beds per 1,000 Permanent Residents (beds)
		A4 Number of Equipment Worth Over 10,000 Yuan (units)
		A5 Number of Departments Established (units)
	Staffing	B1 Number of Licensed (Assistant) Physicians per 1,000 Permanent Residents (persons)
		B2 Number of Registered Nurses per 1,000 Permanent Residents (persons)
		B3 Number of Health Technical Personnel per 1,000 Permanent Residents (persons)
		B4 Number of Registered General Practitioners per 1,000 Permanent Residents (persons)
		B5 Proportion of Licensed (Assistant) Physicians with Bachelor's Degree or Above (%)
		B6 Proportion of Health Technical Personnel with Intermediate Title or Above (%)
		B7 Proportion of Health Technical Personnel with College Degree or Above (%)

Table 4 (continued)

First-level Indicators	Second-level Indicators	Third-level Indicators
Basic Medical Care	Outpatient and Emergency Services	C1 Number of Outpatient and Emergency Visits (person-times)
		C2 Number of Outpatient and Emergency Surgeries (cases)
		C3 Average Cost per Outpatient and Emergency Visit (yuan)
	Inpatient Services	D1 Number of Admissions (person-times)
		D2 Number of Discharges (person-times)
		D3 Number of Inpatient Surgeries (cases)
		D4 Average Medical Expense per Inpatient (yuan)
	Referral Services	E1 Proportion of Referrals to Higher-level Hospitals (%)
		E2 Proportion of Incoming Referrals to Total Admissions (%)
	Service Efficiency	F1 Average Number of Diagnoses and Treatments per Physician per Day (person-times)
		F2 Bed Utilization Rate (%)
		F3 Average Annual Number of Visits per Resident in the Jurisdiction (person-times)
		F4 Follow-up Visit Rate (%)
Business Management	Medical Quality	G1 Outpatient Prescription Qualification Rat (%)
		G2 Consistency Rate of Admission and Discharge Diagnoses (%)
		G3 Total Mortality Rate of Inpatients (%)
Comprehensive Management	Financial Management	H3 Revenue and Expenditure Surplus Rate (%)

3.2.2 Empirical Research

3.2.2.1 Entropy Weight-TOPSIS Method

(1) Standardization of Indicators

Among the evaluation indicators for the medical service capacity of township health centers involved in this study, C3 Average Cost per Outpatient and Emergency Visit (yuan), D4 Average Medical Expense per Inpatient (yuan), F1 Average Number of Diagnoses and Treatments per Physician per Day (person-times), and G3 Total Mortality Rate of Inpatients (%) are negative indicators, while the others are positive indicators. Therefore, the positive and negative indicator formulas in the range method were used for the standardization of indicator values respectively. After calculation, the standardized score matrix of each indicator in each region is shown in Table 5.

Table 5 Standardized Scores for Each Indicator Across Regions

Indicators	Nanjing County	Yong'an City	Zhao'an County	Zhenghe County
A1	1.000	0.182	0.000	0.391
A2	1.000	0.889	0.000	0.770
A3	0.897	1.000	0.000	0.602
A4	1.000	0.740	0.740	0.000
A5	1.000	0.492	0.000	0.364
B1	0.540	1.000	0.000	0.314
B2	1.000	0.886	0.000	0.632
B3	0.892	1.000	0.000	0.573
B4	0.214	1.000	0.000	0.317
B5	0.585	1.000	0.245	0.000
B6	0.528	1.000	0.229	0.000
B7	0.744	1.000	0.756	0.000
C1	0.939	0.485	0.000	1.000
C2	0.462	1.000	0.182	0.000
C3	0.651	0.019	1.000	0.000
D1	1.000	0.797	0.000	0.361
D2	0.000	0.202	1.000	0.639
D3	1.000	0.080	0.199	0.000
D4	1.000	0.464	0.000	0.738
E1	0.211	0.033	1.000	0.000
E2	0.000	0.959	0.927	1.000
F1	0.439	0.233	0.000	1.000
F2	0.991	1.000	0.000	0.759
F3	0.411	0.312	1.000	0.000
F4	1.000	0.767	0.000	0.067
G1	0.326	1.000	0.000	0.386
G2	0.865	1.000	0.000	0.999
G3	1.000	0.000	0.000	0.000
H3	1.000	0.776	0.000	0.761

(2) Indicator Weights, Optimal Vector, and Worst Vector

The entropy weight method was used to calculate the weight W of each indicator, forming a weighted standardized matrix, and the optimal solution P+ and worst solution P- were determined, as shown in Table 6.

Table 6 Weight, Optimal Vector, and Worst Vector for Normalized Indicators

Indicators	W	P+	P-
A1	0.039	0.039	0.000
A2	0.022	0.022	0.000
A3	0.024	0.024	0.000
A4	0.023	0.023	0.000
A5	0.029	0.029	0.000
B1	0.030	0.030	0.000
B2	0.023	0.023	0.000
B3	0.024	0.024	0.000
B4	0.039	0.039	0.000
B5	0.032	0.032	0.000
B6	0.034	0.034	0.000
B7	0.023	0.023	0.000
C1	0.025	0.025	0.000
C2	0.037	0.037	0.000
C3	0.051	0.051	0.000
D1	0.028	0.028	0.000
D2	0.034	0.034	0.000
D3	0.056	0.056	0.000
D4	0.026	0.026	0.000
E1	0.062	0.062	0.000
E2	0.022	0.022	0.000
F1	0.035	0.035	0.000
F2	0.023	0.023	0.000
F3	0.032	0.032	0.000
F4	0.044	0.044	0.000
G1	0.032	0.032	0.000
G2	0.022	0.022	0.000
G3	0.106	0.106	0.000
H3	0.023	0.023	0.000

(3) Euclidean Distance and Proximity Degree

According to the above formulas, the weighted Euclidean distances T+ and T- between the indicator values of each region and the optimal vector and worst vector were calculated respectively. Based on these distance values, the proximity degree C_i between each region and the optimal solution was further calculated. The closer the value is to 1, the higher the similarity between the region and the optimal solution; on the contrary, the closer the value is to 0, the greater the difference from the optimal solution. The calculation results show that the ranking of the average medical service capacity of township health centers in various regions from 2020 to 2023 using the entropy weight-TOPSIS comprehensive evaluation method is: Nanjing County > Yong'an City > Zhao'an County > Zhenghe County.

3.2.2.2 WRSR Method

The results show that the ranking of the average medical service capacity of township health centers in various regions from 2020 to 2023 using the WRSR comprehensive evaluation method is: Yong'an City > Nanjing County > Zhenghe County > Zhao'an County.

3.2.2.3 Fuzzy Combination Method of Entropy Weight-TOPSIS and WRSR

The results show that using the fuzzy combination method of entropy weight-TOPSIS and WRSR, the ranking of the average medical service capacity of township health centers in various regions from 2020 to 2023 is: Nanjing County > Yong'an City > Zhao'an County > Zhenghe County.

3.3 Influence Path of Homogenization on Service Capacity

3.3.1 Distribution of Sample Characteristics

A total of 646 valid questionnaires were recovered in this survey, including 209 males (32.35%) and 437 females (67.65%); the 25-34 age group accounted for the highest proportion (39.63%), while the 60 and above age group accounted for the lowest (only 0.15%); 493 were married (76.32%) and 133 were unmarried (20.59%); in terms ofeducational background, college graduates were the largest group (304 people, 47.06%), followed by bachelor's degree holders (248 people, 38.39%); in terms of job distribution, licensed (assistant) physicians accounted for the highest proportion (215 people, 33.28%), followed by registered nurses (193 people, 29.88%) and other health technical personnel (169 people,

26.16%), with full-time managers being the fewest (10 people, 1.55%); the main working departments of the respondents were clinical departments (335 people, 51.86%), followed by medical technology departments (160 people, 24.77%); 256 people (39.60%) had less than 10 years of work experience, 226 people (34.98%) had 10-19 years, and 164 people (25.40%) had more than 20 years; in terms of professional titles, primary professional titles were the most (338 people, 52.32%), and associate senior titles and above were the fewest (only 55 people, 8.5%); 52.30% of the staff had a monthly income of less than 4,000 yuan, and 47.70% had a monthly income of more than 4,000 yuan; 490 people had formal labor relations, accounting for the largest proportion (75.85%), and 134 people had contractual labor relations (20.74%).

Descriptive statistics and normality tests were conducted on the item data of the questionnaire, and the results are shown in Table 3. The questionnaire included 21 items, using a 1-5 point positive scoring method. The mean value of each item ranged from 3.441 to 4.211, indicating that the respondents generally had a positive attitude towards the questionnaire. The standard deviation of each item ranged from 0.597 to 0.905, indicating that the fluctuation of the respondents' scores on the items was small and the data distribution was reasonable.

Skewness and kurtosis were used to test the normality of each measurement item. According to statistical standards, if the absolute value of the skewness coefficient is less than 3 and the absolute value of the kurtosis coefficient is less than 8, the data can be considered to approximately follow a normal distribution [12]. The analysis results show that the skewness coefficient of each item ranges from -1.174 to -0.075, and the kurtosis coefficient ranges from 0.136 to 3.575. The skewness and kurtosis coefficients of all items meet the conditions of approximate normal distribution, indicating that the data follows an approximate normal distribution.

3.3.2 Reliability Analysis

The results of the reliability analysis showed that the overall Cronbach's alpha coefficient of the scale for the homogenization management level of medical services in county-level medical communities was 0.962, and the Cronbach's alpha coefficients of each variable ranged from 0.900 to 0.977; the overall Cronbach's alpha coefficient of the scale for the medical service capacity of township

health centers was 0.939, and the Cronbach's alpha coefficients of each variable ranged from 0.886 to 0.943. Therefore, the scales used in this study have high internal consistency and reliable reliability.

3.3.3 Validity Analysis

(1) Exploratory Factor Analysis

① KMO and Bartlett's Sphericity Test

This study conducted KMO and Bartlett's sphericity tests [13] on the scale for the homogenization management level of medical services in county-level medical communities and the scale for the medical service capacity of township health centers respectively. The results showed that the KMO values of each scale were greater than 0.8, and the P values of Bartlett's sphericity test were less than 0.001, indicating that the scales had strong correlation and good construct validity, and the sample data was suitable for further factor analysis.

② Principal Component Extraction

The principal component analysis method with varimax rotation was adopted. The results showed that 4 factors were extracted from the scale for the homogenization management level of medical services in county-level medical communities, with a cumulative explained variance of 91.518%, and 4 factors were extracted from the scale for the medical service capacity of township health centers, with a cumulative explained variance of 84.582%, indicating that the extracted 4 factors could fully reflect most of the information of the scales. In addition, the factor loadings of all measurement items were greater than 0.5, and the cross-loadings were less than 0.4. Each item was accurately classified into the corresponding factor, indicating that the scales had good structural validity. At the same time, the communality of each item was greater than 0.7, which fully met the requirement of communality greater than 0.5[14]. Communality represents the degree to which the information contained in each variable can be explained by the extracted principal components, proving the effectiveness of the scales.

(2) Confirmatory Factor Analysis

① Confirmatory Factor Analysis of the Scale for the Homogenization Management Level of Medical Services in County-level Medical Communities

AMOS 24.0 was used to construct the model for the homogenization management level of medical services in county-level medical communities (Fig. 1) for CFA model fit test. The results showed that all fitting indicators of the model reached the recommended reference value range ($\chi^2/df = 4.526$, RMSEA = 0.074, GFI = 0.963, AGFI = 0.930, NFI = 0.984, RFI = 0.975, CFI = 0.987), indicating that the constructed theoretical model had a good fit with the actual data, verifying the validity and reliability of the model. The convergent validity results of the model for the homogenization management level of medical services in county-level medical communities showed that the factor loadings of each variable were greater than 0.5, meeting the minimum standard of factor loadings; the AVE values were greater than 0.5, indicating good convergent validity of the variables; the CR values were greater than 0.7, indicating good indicator reliability of the factors.

For system arrangement, it was also found that the square root of its AVE value was 0.885, which was greater than the maximum absolute value of the correlation coefficient between factors (0.817), indicating good discriminant validity; similarly, the discriminant validity of other factors was good, meaning that the scales analyzed this time had good discriminant validity.

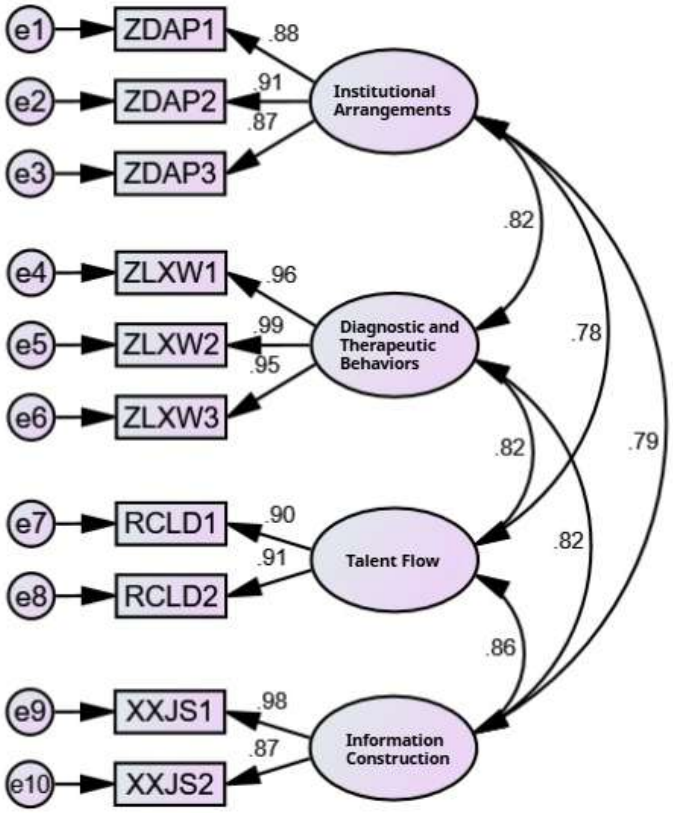


Fig. 1 First-order CFA Model for County Medical Community Homogenization

Based on the theory and the above first-order CFA analysis results, the correlation coefficients of the four latent variables were not small (ranging from 0.78 to 0.86), suggesting that the model may have a higher-level factor structure. A second-order four-factor CFA model for the homogenization management level of medical services in county-level medical communities was constructed (Fig. 2). The CFA model fit test showed that all fitting indicators of the model were within the acceptable range (χ^2/df = 4.786, RMSEA = 0.077, GFI = 0.958, AGFI = 0.925, NFI = 0.982, RFI = 0.973, CFI = 0.985), indicating that the obtained model was relatively ideal.

The convergent validity results of the second-order confirmatory factor model for the homogenization management level of medical services in county-level medical communities showed that the factor loadings of each variable were greater than 0.5, meeting the minimum standard of factor loadings; the AVE values were greater than 0.5, indicating good convergent validity of the variables; the CR values were greater than 0.7, indicating good indicator reliability of the factors.

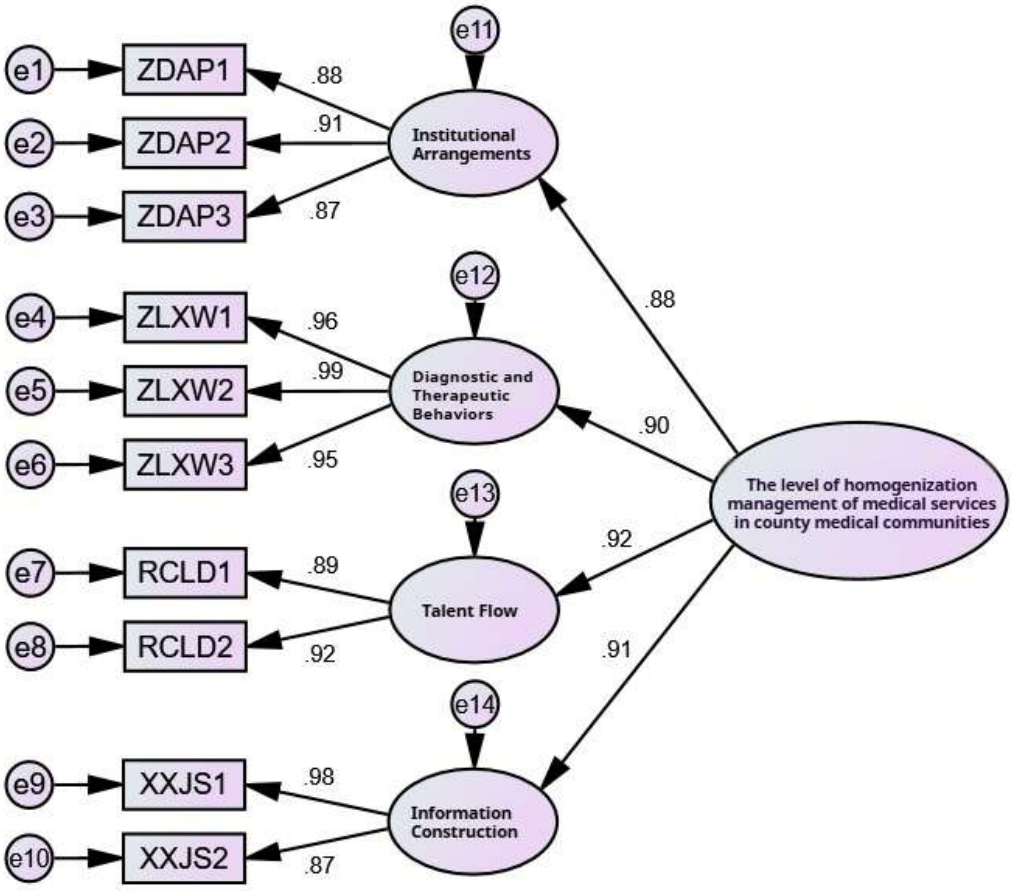


Fig. 2 Second-order CFA Model for County Medical Community Homogenization

② Confirmatory Factor Analysis of the Scale for the Medical Service Capacity of Township Health Centers

AMOS 24.0 was used to construct the initial model of the medical service capacity of township health centers (Fig. 3) for CFA model fit test. The results showed that some fitting indicators of the model did not reach the recommended reference value range, such as χ^2/df =8.660, RMSEA = 0.912, AGFI = 0.857, indicating that the fitting effect of the initial model was not ideal and needed further modification. This study mainly referred to the Modification Indices (MI) provided by AMOS to judge whether variables needed modification. According to the MI values between residual terms, items with excessively high MI values were deleted, or bidirectional arrows were added between residual terms. The model was re-run after each modification. If the fitting effect was still not ideal, the above steps were repeated until the model reached an acceptable state. The modified model of the medical service capacity of township health centers is shown in Fig. 4. All fitting indicators of the modified model reached the recommended reference value range (χ^2/df = 3.946, RMSEA = 0.068, GFI = 0.967, AGFI = 0.937, NFI = 0.978, RFI = 0.966, CFI = 0.983), indicating that the fitting situation of the modified model was good.

Table 7 shows the convergent validity results of the modified model of the medical service capacity of township health centers. The factor loadings of each variable were greater than 0.5, meeting the minimum standard of factor loadings; the convergent validity AVE values were greater than 0.5, indicating good convergent validity of the variables; the composite reliability CR values were greater than 0.7, indicating good indicator reliability of the factors.

Table 7 Convergent Validity of the Modified Model of the Medical Service Capacity of Township Health Centers

Path	Path	Path	Standardized Factor Loading	CR	AVE
ZYPZ1	<---	Resource Allocation	0.915	0.892	0.806
ZYPZ2	<---	Resource Allocation	0.88		
JBYL1	<---	Basic Medical Care	0.856	0.918	0.789
JBYL3	<---	Basic Medical Care	0.869		
JBYL4	<---	Basic Medical Care	0.937		
YWGL1	<---	Business Management	0.846	0.902	0.755
YWGL2	<---	Business Management	0.936		
YWGL3	<---	Business Management	0.821		
ZHGL2	<---	Comprehensive Management	0.855	0.869	0.769
ZHGL3	<---	Comprehensive Management	0.898		

As can be seen from Table 8, for resource allocation, the square root of its AVE value was 0.898, which was greater than the maximum absolute value of the correlation coefficient between factors (0.577), indicating good discriminant validity; similarly, the discriminant validity of other factors was good, meaning that the scales analyzed this time had good discriminant validity.

Table 8 Discriminant Validity of the Modified Model of the Medical Service Capacity of Township Health Centers

	Resource Allocation	Basic Medical Care	Business Management	Comprehensive Management
Resource Allocation	0.898			
Basic Medical Care	0.562***	0.888		
Business Management	0.577***	0.747***	0.869	
Comprehensive Management	0.499***	0.794***	0.654***	0.877

Notes: ① The diagonal is the square root of the Average Variance Extracted (AVE) of each variable, and the other values are the correlation coefficients between each variable. ② * indicates $P<0.05$, ** indicates $P<0.01$, *** indicates $P<0.001$.

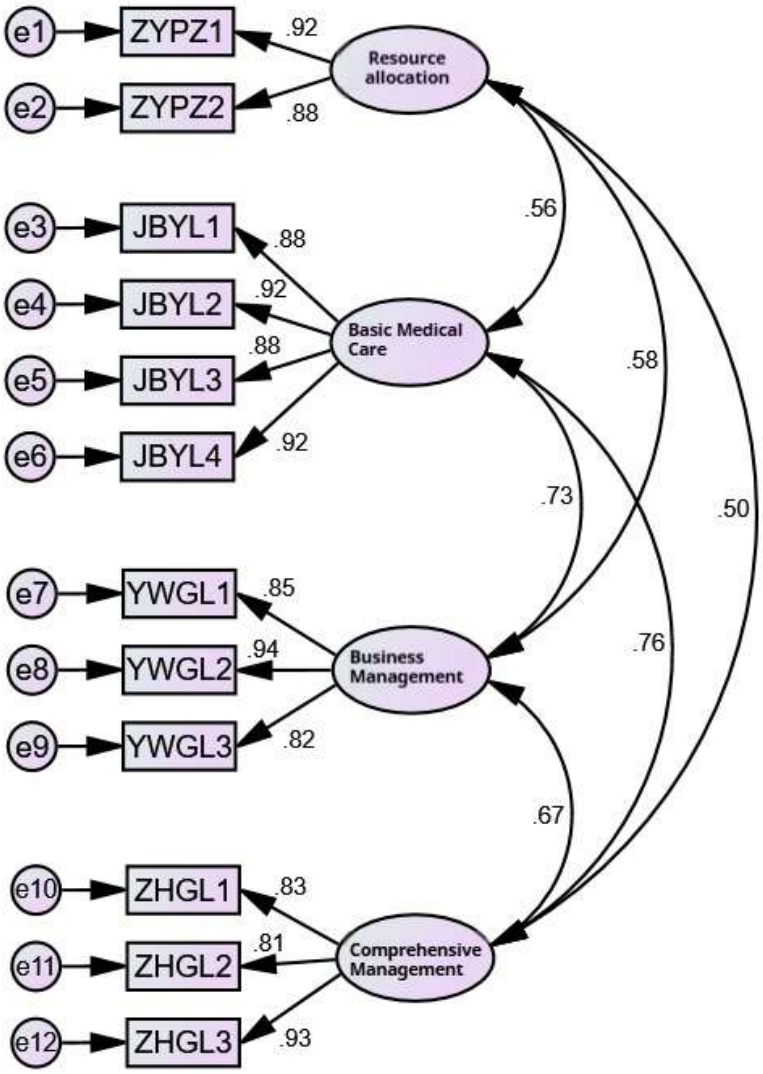


Fig. 3 Initial Model of the Medical Service Capacity of Township Health Centers

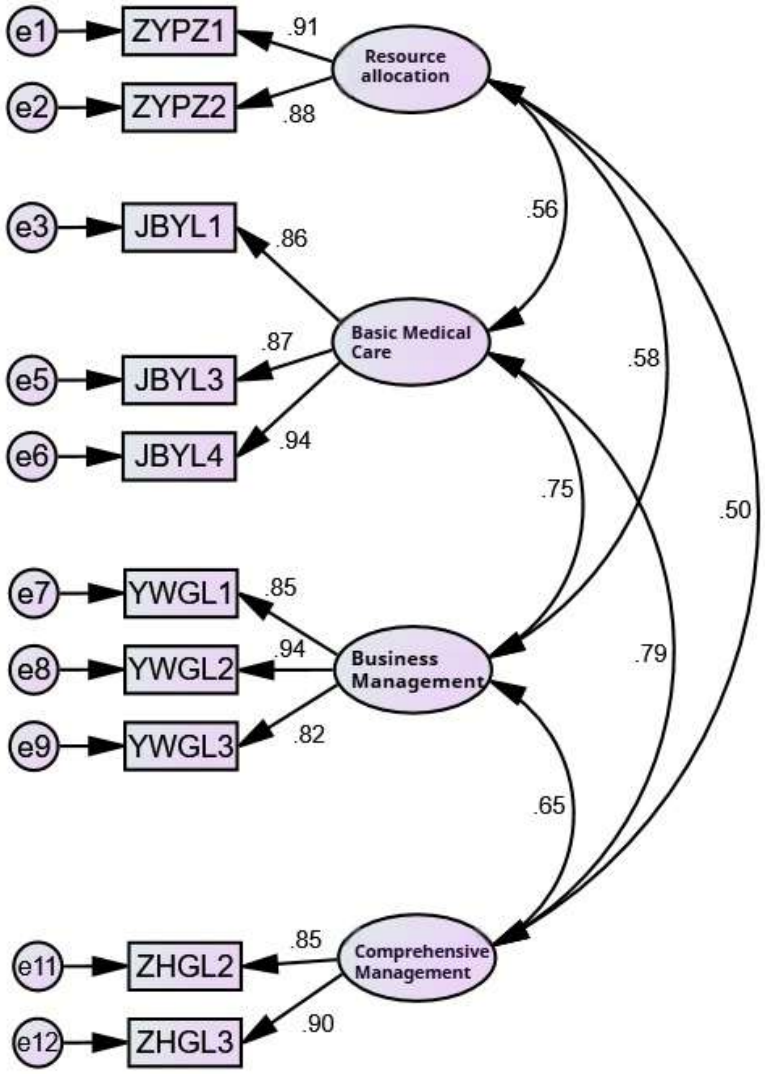


Fig. 4 Modified Model of the Medical Service Capacity of Township Health Centers

Based on the theory and the above first-order CFA analysis results, the correlation coefficients of the four latent variables were not small (ranging from 0.50 to 0.79), suggesting that the model may have a higher-level factor structure [15]. A second-order four-factor CFA model for the medical service capacity of township health centers was constructed (Fig. 5). The CFA model fit test showed that all fitting indicators of the model were within the acceptable range ($\chi^2/df = 4.193$, RMSEA = 0.070, GFI = 0.963, AGFI = 0.934, NFI = 0.975, RFI = 0.964, CFI = 0.981), indicating that the obtained model was relatively ideal.

The convergent validity results obtained by using the second-order confirmatory factor model for the medical service capacity of township health centers showed that the factor loadings of each variable were greater than 0.5, meeting the minimum standard of factor loadings; the AVE values were greater

than 0.5, indicating good convergent validity of the variables; the CR values were greater than 0.7, indicating good indicator reliability of the factors.

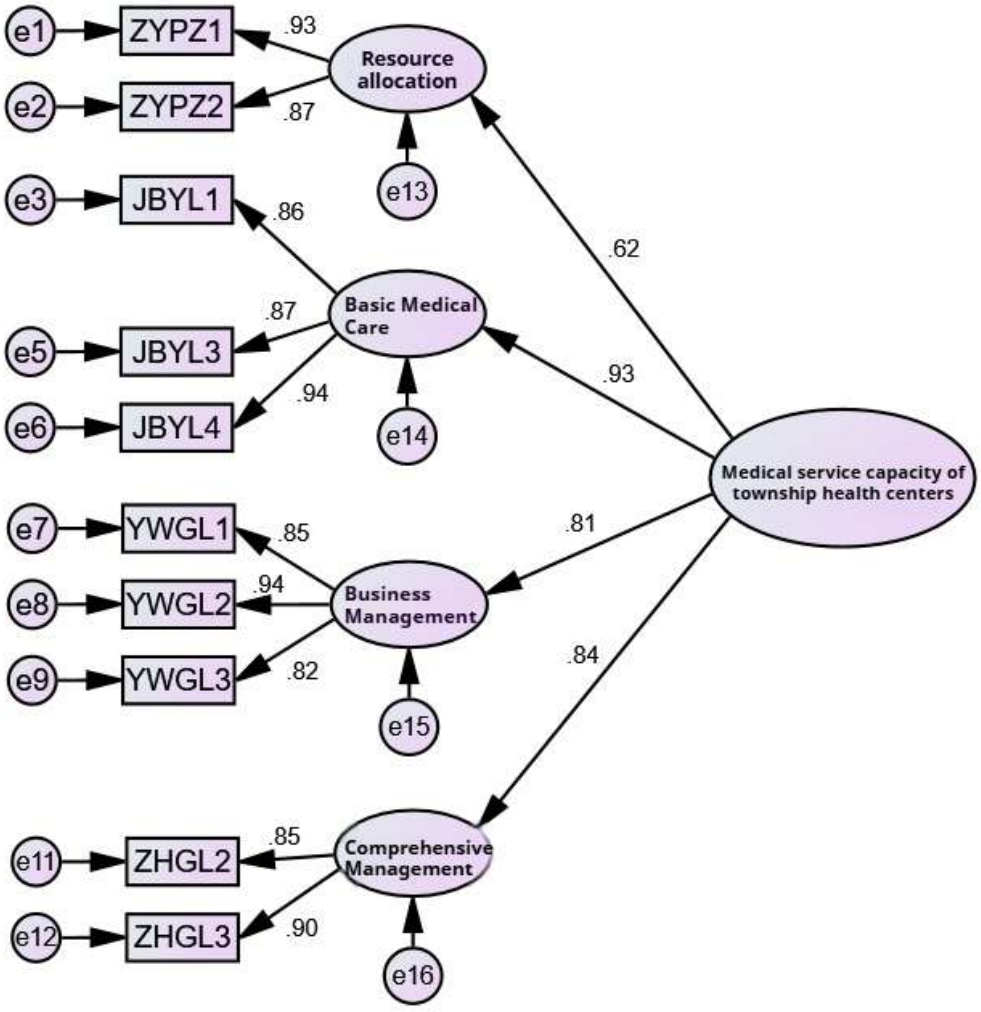


Fig. 5 Second-order Confirmatory Factor Model of the Medical Service Capacity of Township Health Centers

3.4 Test of the Influence Path of Homogenization Management on the Medical Service Capacity of Township Health Centers

(1) Fit Test Using the SEM Model

Based on existing research results, this study put forward the following hypotheses:

H1: The homogenization management level of medical services in county-level medical communities has a significant positive impact on the medical service capacity of township health centers;

H2: The homogenization management level of medical services in county-level medical communities has a significant positive impact on the resource allocation of the medical service capacity of township health centers;

H3: The homogenization management level of medical services in county-level medical communities has a significant positive impact on the basic medical care of the medical service capacity of township health centers;

H4: The homogenization management level of medical services in county-level medical communities has a significant positive impact on the business management of the medical service capacity of township health centers;

H5: The homogenization management level of medical services in county-level medical communities has a significant positive impact on the comprehensive management of the medical service capacity of township health centers.

According to the model fit test results in Table 9, all fitting indicators of the overall model (Fig.6) were within the acceptable range ($\chi^2/df = 3.123$, RMSEA = 0.057, GFI = 0.929, AGFI = 0.907, NFI = 0.963, RFI = 0.957, CFI = 0.975), indicating that the model had a good fit; some fitting indicators of the internal original model (Fig. 7) did not reach the recommended reference value range. The modified internal model is shown in Fig. 8. The results showed that all fitting indicators of the modified internal model reached the recommended reference value range ($\chi^2/df = 2.733$, RMSEA = 0.052, GFI = 0.939, AGFI = 0.918, NFI = 0.969, RFI = 0.962, CFI = 0.980), indicating that the model had a good fit.

Table 9 Fitting Indicators for the SEM Model

Fitting Indicators	χ^2/df	RMSEA	GFI	AGFI	NFI	RFI	CFI
Reference Standards	<5	<0.08	>0.9	>0.9	>0.9	>0.9	>0.9
Overall Model	3.123	0.057	0.929	0.907	0.963	0.957	0.975
Conclusion	Qualified	Qualified	Qualified	Qualified	Qualified	Qualified	Qualified
Internal Original Model	6.462	0.092	0.847	0.802	0.924	0.911	0.935
Conclusion	Unqualified	Unqualified	Unqualified	Unqualified	Qualified	Qualified	Qualified
Internal Modified Model	2.733	0.052	0.939	0.918	0.969	0.962	0.980
Conclusion	Qualified	Qualified	Qualified	Qualified	Qualified	Qualified	Qualified

(2) Results of the Hypothesis Test for the Path Relationship of the SEM Model

This study used the structural equation model to verify and modify the constructed structural model of the relationship between the homogenization management level of medical services in county-level medical communities, the medical service capacity of township health centers, and their latent variables (resource allocation, basic medical care, business management, and comprehensive management). The research and analysis results showed that: in the path hypothesis relationship test of this study, the homogenization management of medical services in county-level medical communities had a significant positive impact on the medical service capacity of township health centers ($\beta = 0.649$, $P < 0.001$), so hypothesis H1 was supported. For the internal medical service capacity of township health centers, the homogenization management of medical services in county-level medical communities had a significant positive impact on resource allocation ($\beta = 0.592$, $P < 0.001$), basic medical care ($\beta = 0.596$,

$P < 0.001$), business management ($\beta = 0.644$, $P < 0.001$), and comprehensive management ($\beta = 0.509$, $P < 0.001$). Therefore, hypotheses H2-H5 were supported, as shown in Table 10

Table 10 Results of the SEM Path Relationship Test

Path Relationship	Path Relationship	Path Relationship	Unstandardized Estimate	Standardized Estimate	S.E.	C.R. (t-value)	P
Medical Service Capacity of Township Health Centers	<---	Homogenization Management of Medical Services in County-level Medical Communities	0.573	0.649	0.047	12.191	***
Resource Allocation	<---	Homogenization Management of Medical Services in County-level Medical Communities	0.750	0.565	0.056	13.518	***
Basic Medical Care	<---	Homogenization Management of Medical Services in County-level Medical Communities	0.632	0.534	0.050	12.696	***
Business Management	<---	Homogenization Management of Medical Services in County-level Medical Communities	0.718	0.615	0.049	14.549	***
Comprehensive Management	<---	Homogenization Management of Medical Services in County-level Medical Communities	0.669	0.471	0.062	10.793	***

Note: *** indicates $P < 0.001$.

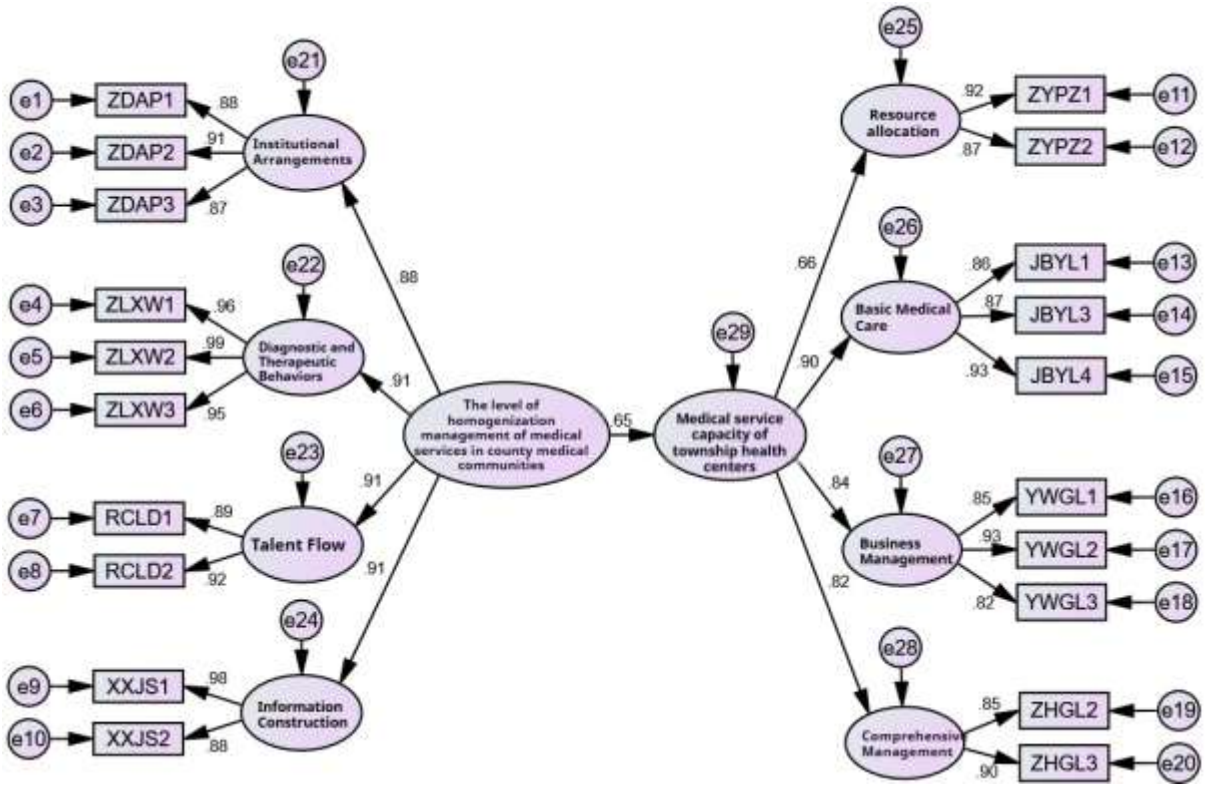


Fig. 6 General Model for SEM Analysis

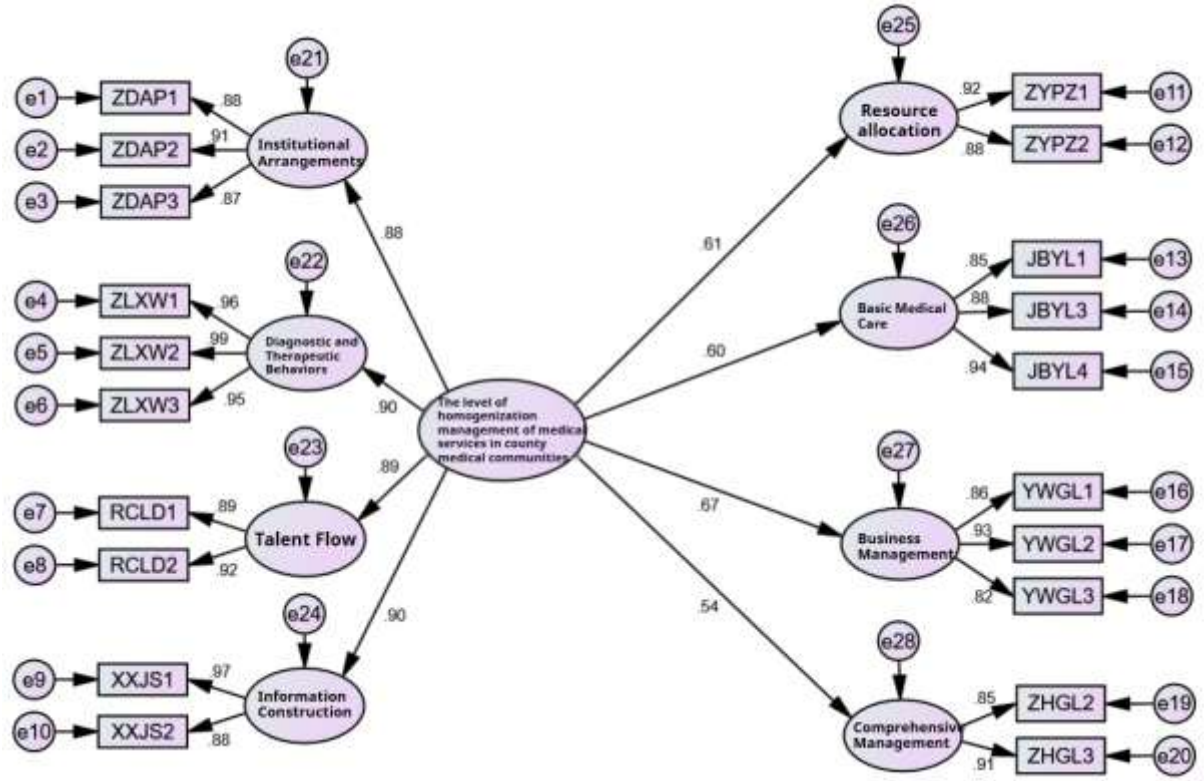


Fig. 7 Internal Original Model for SEM Analysis

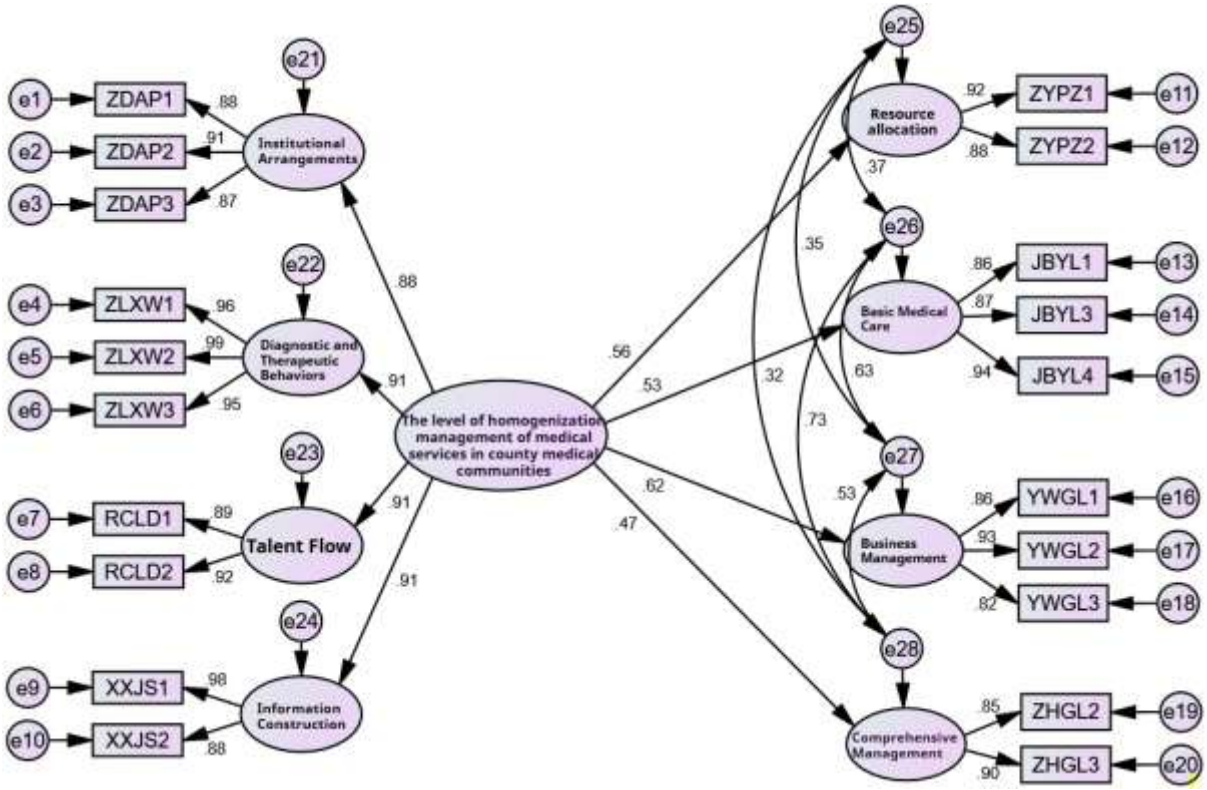


Fig. 8 Internal Modified Model for SEM Analysis

4 Discussion

4.1 The Key Elements of the Homogenization Management of Medical Services in County-level Medical Communities

Through literature research, on-site surveys, and two rounds of Delphi method consultations, this study constructed an evaluation system consisting of 4 first-level indicators, 10 second-level indicators, and 24 third-level indicators, clarifying the core elements of homogenization management. The analytic hierarchy process showed that the weight ranking of the first-level indicators was diagnosis and treatment behaviors (0.364) > system arrangement > information construction > talent flow, and diagnosis and treatment behaviors were the core of homogenization management[16]. Their homogenization can ensure that patients receive standardized treatment in different medical institutions, which is the foundation for realizing hierarchical diagnosis and treatment[17]. The construction of systems, information, talents, and other dimensions all support the homogenized services of diagnosis and treatment behaviors. Currently, the low weight of talent flow is mainly due to the shortage of grassroots talents, and professional talents trained at the grassroots level are also prone to "siphon" loss

due to the scale expansion of large hospitals [18][19], leading to the dual predicament of insufficient current talent level and "training and leaving" at the grassroots level [20-24], as well as the dual predicament of insufficient preparation and lack of patients in grassroots medical institutions, making it difficult to effectively undertake expert resources and give full play to the technical advantages of experts [25].

Among the second-level indicators, organizational structure, health information platform, diagnosis and treatment, and routine nursing had higher weights, indicating that it is necessary to build a county-level health information platform based on a clear organizational structure, and strengthen the diagnosis and treatment and routine nursing levels of each member unit within the medical community, thereby effectively improving the level of medical service homogenization management. Among the third-level indicators, 7 indicators such as the medical quality management department, diagnosis and treatment norms and standards, and regular training, and the application of resource sharing centers ranked top in weight, which are the key objects of attention in practice. This is consistent with the research conclusions of establishing a hierarchical quality control system, unifying norms, and strengthening training and assessment.

4.2 The Influence Path of the Homogenization of Medical Services in County-level Medical Communities on Township Health Centers

The study showed that the homogenization management level of medical services in county-level medical communities had a significant positive impact on the medical service capacity of township health centers ($\beta = 0.649$, $P < 0.001$), and the degree of influence from strong to weak was business management ($\beta = 0.644$, $P < 0.001$), basic medical care ($\beta = 0.596$, $P < 0.001$), resource allocation ($\beta = 0.592$, $P < 0.001$), and comprehensive management ($\beta = 0.509$, $P < 0.001$). As the core driving factor for the coordinated development of county-level medical and health care, homogenization management leads to the comprehensive improvement of the medical service capacity of township health centers through multi-dimensional paths.

In terms of resource allocation, homogenization management promotes the balanced distribution of hardware resources in township health centers according to population size and residents' needs,

effectively meeting the basic medical needs of the masses [26]. At the same time, by building a unified talent management system, implementing the "county recruitment and town use, town management and village use" model, relying on unified talent assessment mechanisms, performance inclination, and opening up promotion channels to attract talents, and improving the professional skills of medical staff through diversified training, the number of grassroots medical talents in some regions has increased by about 50% after reform, promoting the rational flow and optimal allocation of talents within the medical community, and effectively solving the talent bottleneck. In the field of basic medical care, homogenization management promotes the improvement of the diagnosis and treatment capacity of township health centers through technical empowerment and drug guarantee. The medical community formulates unified diagnosis and treatment and nursing norms and standards, such as compiling in-hospital diagnosis and treatment guidelines and refining the diagnosis and treatment process of chronic diseases, to standardize diagnosis and treatment behaviors; at the same time, it builds a unified drug catalog and supply system to ensure drug reserves and quality, standardize rational drug use, reduce the incidence of adverse reactions, and comprehensively improve the reliability of basic medical services[27-29].

Secondly, in terms of basic medical services, the homogenization management level of medical services in county-level medical communities had a significant positive impact on the basic medical care of the medical service capacity of township health centers, and the capabilities of township health centers in outpatient and emergency services, inpatient services, referral services, and service efficiency were significantly improved. Studies have shown that standardized operations such as standardized diagnosis and treatment guidelines for common diseases, as measures to promote the improvement of the homogenization management level of medical services, are the most effective ways to achieve the sound and sustainable development of county-level medical community construction and improve the level of medical and health services within the county. The Changshun County Medical Group improved the nursing quality management system, issued nursing norms and standards, and achieved quality standardization and regularization [30]; the Liuzhou Traditional Chinese Medicine Medical Group compiled in-hospital diagnosis and treatment norms combined with national diagnosis and treatment norms and common diseases in branch hospitals, refining the diagnosis and treatment process

of hypertension and other chronic diseases [22]; the Miyi County Medical Community implemented homogeneous management of medical treatment, nursing, hospital infection, pharmacy, and public health services, formulated more than 10 unified quality control standards, and achieved the homogenization, standardization, and regularization of services in county and township medical institutions [31]. Practice has proved that the medical community's issuance of diagnosis and treatment, nursing, referral and other norms and standards can not only standardize the diagnosis and treatment behaviors of medical staff but also break the problems of information asymmetry and inconsistent diagnosis and treatment standards, promote township health centers to connect with advanced county-level diagnosis and treatment models, and promote homogenized development and improved medical quality.

Thirdly, at the business management level, at present, due to the limitations of their own conditions, grassroots medical institutions have insufficient scientific management awareness of leaders, resulting in an imperfect internal management system. In addition, the shortage of talents and equipment and the shortage of department construction have led to problems such as irregular drug management and medical order to a certain extent, resulting in an lack of guarantee for medical service quality [32-34]. To address this problem, homogenization management, on the one hand, unifies business norms such as emergency systems and rescue processes to improve emergency response capabilities; on the other hand, it establishes a medical community-level medical quality management department and inspection team, formulates unified assessment standards, conducts assessment and monitoring around multiple dimensions and links them to distribution, which has effectively promoted the homogenization of total quality management within the medical community, effectively standardized drug management and medical order, and improved service quality. In the field of comprehensive management, the medical community builds a unified system covering medical quality, performance appraisal, etc., coordinates the use of medical insurance funds, and establishes a unified financial and performance management system. Through economic leverage, the overall development goals of the medical community are internalized into each institution, forming a situation of benefit sharing [35-36]. Some regions have established financial accounting centers to optimize resource allocation and reduce operating costs; at the same time, they have built an integrated information platform for counties, towns, and villages to

achieve medical record sharing and mutual recognition of inspection results, and carry out consultation and teaching through remote systems, allowing grassroots patients to easily access high-quality medical resources and enhancing their sense of medical gain.

Supplementary Information

Additional file 1. This file includes the details of the survey on the homogenization management level of county medical services.

Additional file 2. This file includes the details of the Survey on the homogenization management level of county medical services.

Additional file 3. This file includes detailed of the questionnaire on the homogenization of county medical services and the medical service capacity of township health centers.

Additional file 4. This file includes the exemption approval document of ethical review.

Declarations

Ethics approval and consent to participate

The Biomedical Research Ethics Review Committee of Fujian Medical University deemed that ethical approval was not required for this study. All procedures involved in this study were conducted in strict accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their formal enrollment in the study. All participants were fully informed of the research purpose, study procedures, potential risks and their legitimate rights related to the study, and all participants voluntarily signed the informed consent form. All data were anonymized or de-identified prior to collection, storage and analysis, with personal information and institutional data managed separately to strictly control the risk of disclosure of personal privacy and institutional information.

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Data availability

The datasets employed and/or analysed in the course of this study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Wenjie Li, Yijin Lai, Lin Ye, Dongyu Xue, Changle Li, and Yue Dai contributed to the conception and design of this study. Wenjie Li, Dongyu Xue, Yijin Lai, and Lin Ye were involved in literature screening, data collection, and variables extraction. Dongyu Xue, Changle Li, and Yue Dai analyzed and interpreted the data. The manuscript was drafted by Wenjie Li, Dongyu Xue.Yue Dai and Changle Li provided financial support. The final version was reviewed and approved by all authors.

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References

1. Guiding opinions of the national health and family planning commission on launching pilot programs for medical consortium development. Bulletin of the National Health and Family Planning Commission o f the People's Republic of China. 2016; 47-50. http://www.nhc.gov.cn/ewebeditor/uploadfile/2017/01/20170123164202254.pdf.
2. Guiding opinions of the general office of the state council on promoting the construction and development of medical consortiums. Bulletin of the State Council of the People's Republic of China. 2017;:14–8. https://www.gov.cn/gongbao/content/2017/content_5191699.htm.
3. National health commission, national administration of traditional chinese medicine. Notice on promoting the development of tightly-integrated county-level healthcare communities: national health commission letter [2019] No. 121 [A]. (2019-05-15)[2024-12-15].https://www.gov.cn/zhengce/zhengceku/2019-10/08/content_5437020.htm.
4. Notice of the national health commission and the national administration of traditional chinese medicine on issuing the administrative measures for medical consortiums (trial). The Gazette of the State Counc il of the People's Republic of China. 2020;68–72. https://www.gov.cn/gongbao/content/2020/content_5554582.htm.
5. Guiding opinions on comprehensively promoting the construction of tightly-integrated county-level healthcare communities. Bulletin of the National Health Commission of the People's Republic of China. 2023; :27-30. https://www.gov.cn/gongbao/content/2020/content_5554582.htm.
6. Feng C, Chen Y, Wang W, Chen S. Can medical consortiums bridge the gap in health inequity in China? A propensity score matching analysis. Health Policy Plan. 2025;40:727-36. https://doi.org/10.1093/heapol/czaf031.
7. Meessen B, Ancia A, Gill D, LaFoucade A, Lalta S, Sandoval G, et al. When one size does not fit all: aid and health system strengthening for small island developing States. Health Policy Plan. 2024;39 Supplement_1: i4-8. https://doi.org/10.1093/heapol/czad089.
8. Wang X, Nie X. The uneven distribution of medical resources for severe diseases in China: An analysis of the disparity in inter-city patient mobility. Appl Geogr. 2024;165: 103226. https://doi.org/10.1016/j.apgeog.2024.103226.
9. Zhang M, Du X, Jia G, Xia Q, Xu Y, Wu J, et al. Comparative study on the satisfaction of healthcare ser vice providers with the synergistic development of rural healthcare systems in China: medical alliance counties vs. Non-Medical Alliance Counties. Int J Integr Care. 2024; 24:26. https://doi.org/10.5334/ijic.7677.
10. Gil B, Pascual-Ezama D. La metodología Delphi como técnica de estudio de la validez de contenido. An

Psicol. 2012; 28:1011-20. https://doi.org/10.6018/analesps.28.3.156211.

11. Wang L, Li F, Jiang S, Xia J. Comprehensive evaluation of primary health care service capacity in Chi na based on TOPSIS and RSR methods. Front Public Health. 2025; 13:1657961. https://doi.org/10.33 89/fpubh.2025.1657961.
12. Meer DJ, Weeks ER. Bounded distributions place limits on skewness and larger moments. PLOS ONE. 2024;19: e0297862. https://doi.org/10.1371/journal.pone.0297862.
13. Winters CA, Moore CF, Kuntz SW, Weinert C, Hernandez T, Black B. Principal components analysis to identify influences on research communication and engagement during an environmental disaster. BMJ Open. 2016;6: e012106. https://doi.org/10.1136/bmjopen-2016-012106.
14. Sales L, Cardoso AF, Araújo B, Jesus É. Development and psychometric validation of the hospital med ication system safety assessment questionnaire. Nurs Rep. 2026;16. https://doi.org/10.3390/nursrep16 010022.
15. Shek DTL, Yu L. Confirmatory factor analysis using AMOS: a demonstration. Int J Disabil Hum Dev. 2014;13: 191-204. https://doi.org/10.1515/ijdhd-2014-0305.
16. Bhatia A, Swaminathan JM. Measuring consistency in service delivery: examining the effect of process standardization on hospital performance. Prod Oper Manag. 2025;10591478251361985. https://doi.or g/10.1177/10591478251361985.
17. Sun P. demand-oriented differentiation and homogeneous management strategies for multi-campus public hospitals. Int J Sci Bus. 2024. https://doi.org/10.58970/IJSB.2467.
18. Yang G, Zhang X, Xu Z, Zhang L. Social medical insurances, choices of medical institutions and the 'siphon effect' in the health service market: evidence from 2021 yangtze river delta region of China. Risk Manag Healthc Policy. 2024;17: 1287–99. https://doi.org/10.2147/RMHP.S458178.
19. Topmiller M, Peterson LE, Bazemore AW, Kamerow DB. Retention of family physicians in the national health service corps (NHSC) in high-need areas. J Am Board Fam Med. 2025;38: 768–9. https://doi.org/10.3122/jabfm.2025.250083R1.
20. Arredondo K, Touchett HN, Khan S, Vincenti M, Watts BV. Current programs and incentives to overcome rural physician shortages in the United States: a narrative review. J Gen Intern Med. 2023;38: 916–22. https://doi.org/10.1007/s11606-023-08122-6.
21. Endalamaw A, Khatri RB, Erku D, Zewdie A, Wolka E, Nigatu F, et al. Barriers and strategies for primary health care workforce development: synthesis of evidence. BMC Prim Care. 2024;25: 99. https://doi.org/10.1186/s12875-024-02336-1.
22. Yang Jun, Wei Liuping, Li Xuhong, Huang Ying. The effect of homogeneous management based on the "Three-in-One" medical consortium on improving medical quality in primary healthcare institutions: a case study of shibiping town health center in Liubei district, Liuzhou City. China Rural Health. 2024;16:24–7. https://doi.org/10.20126/j.cnki.1674-361X.2406-041.
23. Kanchanachitra C, Lindelow M, Johnston T, Hanvoravongchai P, Lorenzo FM, Huong NL, et al. Human resources for health in southeast Asia: shortages, distributional challenges, and international trade in health services. The Lancet. 2011;377: 769–81. https://doi.org/10.1016/S0140-6736(10)62035-1.

24. Fritzen SA. Strategic management of the health workforce in developing countries: what have we learned? Hum Resour Health. 2007;5: 4. https://doi.org/10.1186/1478-4491-5-4.
25. Shan L, Gan Y, Yan X, Wang S, Yin Y, Wu X. Uneven primary healthcare supply of rural doctors and medical equipment in remote China: community impact and the moderating effect of policy intervention. Int J Equity Health. 2024;23: 97. https://doi.org/10.1186/s12939-024-02183-7.
26. Zheng Peijun, Chen Minya, Gong Shujun, Xie Haofen. Practice andreflections on integrated homogene ous management of outpatient services across multiple hospital campuses. Hospital Management Foru m. 2023;40:41–3. https://kns.cnki.net/kcms2/article/abstract?v=dKcr_PZ1zcvLNjY7ZnwaOy57iULG NuGf8v1uwD3H0DQwcXoBpeHK7x5pf5N_6sRKJJk3cfWyQEiby59NOXtUXGRZgmfgoRhk2hm2 bKNYNvxgUr9lXmowTadyo4FRzo3jq0hDg5Da2_Nc23wop4kNFDG3nrtwn7BE4AbBHZ4q9uttn6g XucQsPw==&uniplatform=NZKPT&language=CHS
27. Ding S, Zhou Y. County medical community, medical insurance package payment, and hierarchical dia gnosis and treatment—Empirical analysis of the impact of the pilot project of compact county medical communities in Sichuan Province. PLOS ONE. 2024;19: e0297340. https://doi.org/10.1371/journal.p one.0297340.
28. Saddique A. Integrated delivery systems (IDSs) as a means of reducing costs and improving healthcare delivery. J Healthc Commun. 2017;03. https://doi.org/10.4172/2472-1654.100129.
29. Wan TTH, Lin BY-J, Ma A. Integration mechanisms and hospital efficiency in integrated health care delivery systems. J Med Syst. 2002;26: 127–43. https://doi.org/10.1023/a:1014805909707.
30. Peng Shuangfei, Liu Guoqin, Yao Li. exploring differentiated development practices in homogeneous mursing quality management following the restructuring of xounty-level medical groups. China Rural Health. 2024;16: 28–31. https://doi.org/10.20126/j.cnki.1674-361X.2404-023.
31. Miyi county, Panzhihua City: “eight unifications” management advances county-level medical consorti um development. China Health. 2024;:82–3.https://doi.org/10.15973/j.cnki.cn11-3708/d.2024.06.030.
32. Zhang A, Nikoloski Z, Albala SA, Yip W, Xu J, Mossialos E. Patient choice of health care providers in China: primary care facilities versus hospitals. Health Syst Reform. 2020;6: e1846844. https://doi.org /10.1080/23288604.2020.1846844.
33. Sitienei J, Manderson L, Nangami M. Community participation in the collaborative governance of primary health care facilities, Uasin Gishu County, Kenya. PLOS ONE. 2021;16: e0248914. https://doi.org/10.1371/journal.pone.0248914.
34. 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 Serv Res. 2016;16: 335. https://doi.org/10.1186/s12913-016-1604-2.
35. Ye Y, Evans R, Jing L, Rizwan M, Xuan Y, Lu W. The impact of county medical community reform on the medical service efficiency of county-level public general hospitals in China: A Case Study of Shanxi Province. Int J Environ Res Public Health. 2022;19: 13827. https://doi.org/10.3390/ijerph192113827.
36. Wu C, Tu Y, Li Z, Yu J. An early assessment of the county medical community reform in China: a case study of Zhejiang province. J Chin Gov. 2021;6: 463–85. https://doi.org/10.1080/23812346.2021.197

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