Postprint: A Study on the Service Capacity for Integrated Medical-Preventive Care and Its Influencing Factors among Primary Care Physicians in Shandong Province

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Date: 2025-03-31T00:00:00+00:00

Abstract

Background Primary care physicians serve as the main providers of integrated medical and preventive services, and understanding their current service capacity is crucial for guiding and optimizing related work. However, there is currently a lack of evaluation studies and systematic analyses on the integrated medical and preventive service capacity of primary care physicians.

Objective To understand the current status of integrated medical and preventive service capacity among primary care physicians in Shandong Province and analyze its influencing factors, so as to provide a basis for improving their capacity.

Methods In August 2023, a multi-stage stratified random sampling method was used to conduct a questionnaire survey among 477 rural/community physicians in Shandong Province. The questionnaire included two parts: basic characteristics of primary care physicians and evaluation of their integrated medical and preventive service capacity. Using 80% and 60% of the total score and each dimension score as cutoffs, participants were divided into three groups: high, medium, and low score groups, where $ $80% was the high-score group, $ $60% and <80% was the medium-score group, and <60% was the low-score group. Ordinal multinomial Logistic regression analysis was used to explore influencing factors of primary care physicians' integrated medical and preventive service capacity.

Results A total of 273 primary care physicians (57.2%) had high total scores for integrated medical and preventive service capacity. The numbers of participants in the low-score groups for the dimensions of professional knowledge and skills and comprehensive service capacity were 67 (14.0%) and 40 (8.4%),

respectively. Primary care physicians with a bachelor' s degree or higher (OR = 3.470, 95% CI = 1.802-6.680), those who understood integrated medical and preventive policies (OR = 4.211, 95% CI = 2.742-6.468), those who perceived that their institution valued integrated medical and preventive services (OR = 2.36, 95% CI = 1.347-4.138), and those who had participated in two or more trainings on integrated medical and preventive services (OR = 2.557, 95% CI = 1.228-5.324) had better service capacity ($P < 0.05$).

Conclusion The overall level of integrated medical and preventive service capacity among primary care physicians is currently good, but improvements are still needed in professional knowledge and skills and comprehensive service capacity. Greater emphasis should be placed on promoting integrated medical and preventive services, implementing targeted professional training, and innovating assessment and incentive mechanisms to promote primary care physicians' improvement in knowledge and skills and further enhance their integrated medical and preventive service capacity.

Full Text

Study on the Service Capability of Primary Care Doctors to Integrate Medical and Preventive Services and Its Influencing Factors in Shandong Province

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Abstract

Background: Primary care doctors are the main providers of integrated medical and preventive services. Understanding their current service capacity is crucial for guiding and optimizing relevant practices. However, systematic evaluations and comprehensive analyses of primary care doctors' capabilities to integrate medicine and prevention remain limited.

Objective: This study aimed to assess the current capacity of primary care doctors in Shandong Province for delivering integrated medical and preventive services and to analyze the factors influencing this capacity, providing a reference for improvement strategies.

Methods: In August 2023, a multi-stage stratified random sampling method was used to conduct a questionnaire survey of 477 rural and community physicians in Shandong Province. The questionnaire included demographic characteristics and an evaluation of integrated service capacity. Scores for overall and dimension-specific capacities were categorized into high ($ 80 $60% and <80%), and low (<60%) groups. Ordinal logistic regression was used to identify factors influencing integrated service capacity.

Results: Among the respondents, 273 doctors (57.2%) demonstrated high overall capacity for integrated services. The number of doctors in the low-score group for professional knowledge and skills and for comprehensive service ability were 67 (14.0%) and 40 (8.4%), respectively. Higher capacity was associated with having a bachelor' s degree or above (OR=3.470, 95%CI=1.802-6.680), awareness of policies on medical and preventive integration (OR=4.211, 95%CI=2.742-6.468), perceived organizational emphasis on integration services (OR=2.361, 95%CI=1.347-4.138), and participation in at least two training sessions on integration (OR=2.557, 95%CI=1.228-5.324) (P<0.05).

Conclusion: The overall capacity of primary care physicians in Shandong Province to deliver integrated medical and preventive services is satisfactory. However, there is a need to strengthen professional knowledge, skills, and comprehensive service abilities. Efforts should focus on raising awareness of medical-preventive integration, implementing targeted training programs, and establishing innovative assessment and incentive mechanisms to further enhance the capacity of primary care doctors in this area.

Keywords: Physicians, primary care; Primary care doctors; Integration of medical and preventive care; Service capability; Root cause analysis; Ordered multi-categorical logistic regression analysis

Introduction

As a novel comprehensive healthcare service concept, the integration of medical and preventive services is becoming increasingly important in contemporary medicine [1]. Across China, various regions are actively exploring service models that combine medical treatment with preventive care to achieve whole-process health management. Shandong Province, in particular, has been promoting the effective integration of medical and preventive services through chronic disease management pilot programs to better meet residents' diverse health needs. Primary care doctors serve as the first line of defense for residents' health and bear significant responsibility for delivering these integrated services under this new

paradigm [2-3]. This integration requires primary care doctors to possess not only traditional medical knowledge and skills but also strong professional ethics and competencies in doctor-patient communication, health education, disease prevention, and teamwork [4]. Current research both domestically and internationally has focused primarily on doctors' awareness of medical-preventive integration, while systematic investigations and in-depth analyses of their actual service capacity remain scarce [5].

This study employs a self-developed evaluation index system to comprehensively survey the capacity of primary care doctors in Shandong Province to deliver integrated services, identify influencing factors, and systematically recognize deficiencies in their capabilities, thereby providing scientific evidence for improvement strategies.

Methods

Study Subjects

In August 2023, we used a multi-stage stratified random sampling method to select study participants. Based on geographic location and economic development level, we selected Yantai, Weifang, and Liaocheng cities in Shandong Province, representing eastern, central, and western regions respectively. In each city, we randomly chose one district and one county/county-level city as sample areas. From each district, we randomly selected three street community health service centers or township health centers, and from each county/county-level city, we randomly selected four township health centers or street community health service centers as sample units. All primary care clinicians on duty at these institutions on the survey day were gathered, and approximately 15 village doctors/community doctors were randomly selected from each jurisdiction for the questionnaire survey.

Inclusion criteria were: (1) clinicians on duty on the survey day, and (2) understanding and voluntary participation. Exclusion criteria were: (1) unwillingness to sign informed consent, and (2) missing key information or logical errors in questionnaire responses. A total of 488 questionnaires were distributed, and 477 valid questionnaires were collected after excluding unreturned and incomplete ones, yielding a response rate of 97.7%. This study was approved by the Ethics Committee of the School of Public Health at Shandong University (Approval No. LL20221120), and all participants provided informed consent.

Survey Instrument

The questionnaire consisted of two parts: basic characteristics of primary care doctors and evaluation of integrated service capacity. Basic characteristics included demographic features (gender, age, marital status) and work-related features (education, professional title, income, years of practice, employment status). The integrated service capacity evaluation questionnaire was designed

based on a self-developed "Index System for Primary Care Doctors' Capacity to Integrate Medical and Preventive Services," with three primary evaluation dimensions: professional quality, comprehensive service ability, and professional knowledge and skills. The professional quality dimension included nine items addressing attitudes, awareness, and cognition required for integrated services. The comprehensive service ability dimension included eight items covering teamwork, doctor-patient communication, and information/data application capabilities. The professional knowledge and skills dimension included nine items addressing knowledge of prevention, diagnosis and treatment, and health management.

A 5-point Likert scale was used, scored from 1 ("strongly disagree") to 5 ("strongly agree"). Integrated service capacity scores were calculated based on the total score of 26 items, with dimension-specific scores calculated from respective item totals. Individual item scores were categorized as high ($ 4points), medium(3and < 4points), orlow(< 3points).Accordingly, overallanddimension−specifictotalscoreweredividedintohigh(80 $60% and <80%), and low (<60%) groups. The questionnaire demonstrated good reliability and validity, with a Cronbach' s α coefficient of 0.962 and KMO value of 0.961.

Statistical Analysis

We established the database using EpiData 3.1 and performed statistical analysis with IBM SPSS 26. Categorical data were presented as relative frequencies, and between-group comparisons were conducted using chi-square tests. Ordinal logistic regression was used to explore factors influencing integrated service capacity, with collinearity tests and goodness-of-fit tests performed to ensure model appropriateness [6]. Statistical significance was set at P<0.05.

Results

Basic Characteristics of Study Subjects

A total of 477 primary care doctors were surveyed. Among them, 209 (43.8%) were male and 268 (56.2%) were female; 415 (87.0%) were married. The largest age group was 40-49 years (178 doctors, 37.3%), while only 76 (15.9%) were under 30. Regarding institution location, 261 (54.7%) worked in township areas. The majority had bachelor' s degrees or above (215 doctors, 45.1%), while 111 (23.3%) had high school or technical secondary education or below. Years of practice were mainly distributed between 10-19 years (139 doctors, 29.1%) and 20-29 years (151 doctors, 31.7%), followed by <10 years (115 doctors, 24.1%). For professional titles, 161 (33.8%) had none, 192 (40.3%) had junior titles, and 126 (26.0%) had intermediate or higher titles. Over half (244 doctors, 51.2%) had monthly incomes between 2,500-4,999 yuan. Regarding policy awareness, 230 doctors (48.2%) understood medical-preventive integration policies, and 418 (87.6%) believed their institutions emphasized integrated services. In terms

of training, 263 doctors (55.1%) had received one training session within six months, 171 (35.8%) had two or more sessions, and only 43 (9.0%) had never received training .

Current Status of Primary Care Doctors' Integrated Service Capacity

Overall, 273 doctors (57.2%) scored in the high group for total integrated service capacity, while only 40 (8.4%) scored in the low group. For specific dimensions, the low-score group comprised 67 doctors (14.0%) for professional knowledge and skills and 40 doctors (8.4%) for comprehensive service ability .

Univariate Analysis of Integrated Service Capacity

No statistically significant differences were found in integrated service capacity scores by gender (^{2}=2.071, P=0.355), age (^{2}=7.384, P=0.287), or marital status (^{2}=0.506, P=0.777) (P>0.05). However, significant differences were observed by institution location (^{2}=6.216, P=0.045), education level (^{2}=25.723, P<0.001), years of practice (^{2}=13.297, P=0.039), professional title (^{2}=15.282, P=0.004), monthly income (^{2}=12.877, P=0.012), policy awareness (^{2}=75.014, P<0.001), perceived institutional emphasis (^{2}=22.160, P<0.001), and training frequency (^{2}=17.141, P=0.002) .

Ordinal Logistic Regression Analysis

Collinearity tests showed that except for "age" and "years of practice" with variance inflation factors (VIF) of 4.58 and 4.09 respectively, all other nine explanatory variables had VIF values below 2, indicating no collinearity issues [6]. Model fit statistics showed a likelihood ratio chi-square of 121.53 (P=0.000), significant at the 1% level [7], with log likelihood of -365.81889 and pseudo R^2 of 0.1425, indicating good model fit.

Ordinal logistic regression analysis, using integrated service capacity as the dependent variable and basic characteristics as independent variables, revealed that compared with doctors having high school/technical secondary education or below, those with bachelor' s degrees or above (OR=3.470, 95%CI=1.802-6.680, P<0.001) and college degrees (OR=1.794, 95%CI=1.049-3.069, P=0.030) had higher capacity scores. Doctors aware of integration policies (OR=4.211, 95%CI=2.742-6.468, P<0.001) and those who perceived their institutions as emphasizing integrated services (OR=2.361, 95%CI=1.347-4.138, P=0.003) also demonstrated higher capacity. Additionally, doctors who participated in two or more training sessions (OR=2.557, 95%CI=1.228-5.324, P=0.012) had significantly higher capacity scores compared to those with no training .

Discussion

Primary Care Doctors' Integrated Service Capacity Shows Room for Further Improvement

The study found that primary care doctors' overall capacity for integrated services is satisfactory. Most doctors possess the professional qualities needed for integration, demonstrating strong work values and commitment to their role as health gatekeepers, which reflects high ethical standards and responsibility [8]. However, among the three evaluation dimensions, professional knowledge and skills showed the highest proportion in the low-score group, likely because doctors' knowledge structures and skills are relatively narrow, making it difficult to meet integration requirements [9]. Specifically, knowledge of disease prevention and clinical diagnosis/treatment had notably high proportions in the low-score groups, indicating deficiencies that represent major barriers to capacity enhancement. Additionally, information/data application ability had the highest proportion in the low-score group for comprehensive service ability, possibly due to lagging information system development at the primary care level and doctors' limited proficiency with these systems, consistent with previous research [10]. Although most doctors demonstrated strong teamwork abilities, nearly half showed only moderate doctor-patient communication skills. Overall, comprehensive service abilities require further improvement to better support integrated services. Therefore, targeted training in prevention, diagnosis, and treatment knowledge should be implemented alongside strengthened primary care information system development to provide practical guidance on professional knowledge and system operations [11].

Education and Professional Title Levels Influence Integrated Service Capacity

The study demonstrated that higher education levels are associated with better integrated service capacity, likely because more educated doctors receive more systematic medical education and training, acquiring comprehensive medical and preventive knowledge that enables them to understand and implement integrated health management strategies [12]. Consistent with previous findings [2,13], doctors in street community health centers showed better capacity than those in township institutions, possibly reflecting institutional capacity differences. Township institutions tend to have fewer highly educated personnel, less training in integrated services, and lagging information infrastructure and equipment, limiting doctors' capacity development. Higher professional titles were also associated with better capacity, likely because senior doctors have richer practical experience, deeper professional knowledge, and stronger comprehensive service abilities, enabling them to handle complex challenges in integrated service delivery [14]. Therefore, medical education reforms should incorporate more integration-focused curricula, and professional title promotion mechanisms should be refined to motivate practicing doctors to pursue further education and enhance their integrated service capacity [5,14].

Policy Awareness, Institutional Emphasis, and Training Affect Integrated Service Capacity

The study identified policy awareness, perceived institutional emphasis, and training frequency as important factors influencing integrated service capacity. Doctors familiar with integration policies demonstrated better capacity, possibly because their institutions provided stronger policy advocacy and interpretation support, helping them effectively incorporate policy requirements into practice and actively participate in integrated services [15-16]. Research indicates that institutional emphasis on integration, demonstrated through policy advocacy and regular meetings, provides better support and development opportunities, motivating doctors to enhance their capabilities [17]. Doctors who received two or more training sessions within six months showed higher capacity levels, as training provides new professional knowledge, policy updates, and technical skills that enhance innovation and adaptability in integrated service delivery [18]. Therefore, greater emphasis should be placed on policy promotion and advocacy to improve doctors' awareness, while training mechanisms for integrated services should be strengthened to comprehensively enhance primary care doctors' capacity [19].

This study provides an accurate and in-depth analysis of the current status and influencing factors of primary care doctors' integrated service capacity in Shandong Province. While overall capacity is satisfactory, deficiencies remain in professional knowledge, skills, and comprehensive service abilities. Efforts should focus on increasing emphasis and publicity for integrated services, implementing targeted training, and innovating assessment and incentive mechanisms to promote capacity building. This study has several limitations. First, self-reported capacity assessments may introduce subjective bias. Second, the relatively small sample size limits representativeness. Finally, the cross-sectional design is better suited for examining associations than establishing causal relationships. Future research should incorporate objective indicators, larger samples, and multiple analytical methods to provide more robust evidence for advancing integrated medical and preventive services.

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Author Contributions: Huifang Zhang and Cunchuan Chen conceptualized the study, designed the research, performed statistical analysis, and drafted the manuscript. Boyang Fan, Wenning Sun, Yingjie Wang, and Ao Zhang collected, compiled, and analyzed the data. Huifang Zhang was primarily responsible for manuscript revision. Yang Zhao and Haipeng Wang provided quality control and review, and had overall responsibility for the study and its supervision.

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

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(Received: October 15, 2024; Revised: January 20, 2025)
(Editor: Cui Sha)

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