Post-print: A Survey Study on General Practitioners' Intention to Participate in Tiered Healthcare Based on an Integrated Model of the Theory of Planned Behavior and Technology Acceptance Model

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Abstract

Background Hierarchical medical system is one of the primary objectives of healthcare reform. The Guidance on Promoting the Construction of Hierarchical Medical System (Guobanfa [2015] No. 70) issued by the General Office of the State Council in 2015 proposed that the proportion of outpatient visits at primary healthcare institutions should exceed 65% by 2017; however, the actual proportion was 54.2% that year, and has demonstrated an overall declining trend in recent years. Previous literature has predominantly focused on the demand side (patients), while investigations into the willingness of general practitioners, as one of the supply-side providers of hierarchical medical system, to participate remain relatively scarce.

Objective This study takes Suzhou City as an example to investigate general practitioners' willingness to participate in hierarchical medical system, analyze its influencing factors, provide recommendations for enhancing their participation willingness, and offer reference for formulating relevant policies on hierarchical medical system.

Methods In June 2022, a multi-stage convenience sampling method was employed to select 1,451 general practitioners from 175 primary healthcare institutions across 4 counties and 6 districts in Suzhou City. A self-designed questionnaire was administered, comprising sections on basic information (demographic characteristics) of general practitioners and their willingness to participate in hierarchical medical system. The latter section was developed based on an extended model of influencing factors for general practitioners' willingness to

participate in hierarchical medical system, constructed by integrating the Theory of Planned Behavior and Technology Acceptance Model with content collected through literature review and interviews. Based on the survey results, Structural Equation Modeling (SEM) was utilized to test the goodness-of-fit of the extended model and evaluate model fit. Exploratory Factor Analysis was employed to calculate the weights (influence) of each influencing factor and construct a relational model of the influencing factors.

Results A total of 1,451 general practitioners participated in the survey, with 1,302 valid questionnaires collected, yielding an effective response rate of 89.73%. The extended model of influencing factors demonstrated good fit. In the relational model, participation attitude, subjective norm, and perceived behavioral control jointly influenced general practitioners' willingness to participate in hierarchical medical system, with weights of 46.22%, 9.75%, and 44.02%, respectively. Perceived benefits and perceived ease of use jointly explained participation attitude, with weights of 15.14% and 31.08%, respectively. Disposable resources and anticipated resistance jointly explained perceived behavioral control, with weights of 27.07% and 16.95%, respectively.

Conclusion The degree of recognition of higher-level hospitals' medical service capacity by general practitioners, the complexity of referral procedures, and the extent to which higher-level hospitals' medical resources are accessible to general practitioners exert substantial influence on their willingness to participate. Recommendations are proposed from administrative, organizational, and individual levels, including strengthening personnel exchange and interaction within medical consortiums, utilizing information technology to simplify referral processes and procedures, encouraging higher-level hospitals to provide general practitioners with prioritized appointment access to outpatient slots, inpatient beds, and other medical resources in a targeted and quantitative manner, and implementing other measures to enhance general practitioners' willingness to participate in hierarchical medical system.

Full Text

Research on the Willingness of General Practitioners to Participate in Graded Diagnosis and Treatment Based on the Fusion Model of TPB and TAM

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Abstract

Background: Graded diagnosis and treatment represents a primary objective of healthcare reform. In 2015, the General Office of the State Council issued the "Guiding Opinions on Promoting the Construction of a Graded Diagnosis and Treatment System" (Guo Ban Fa [2015] No. 70), which stipulated that primary healthcare institutions should account for over 65% of total patient visits by 2017. However, the actual proportion reached only 54.2% that year and has since demonstrated an overall declining trend. While existing literature has predominantly focused on the demand side (patients), few studies have investigated the supply side, particularly the willingness of general practitioners—key providers in the graded diagnosis and treatment system—to participate in this initiative.

Objective: This study examines the factors influencing general practitioners' willingness to participate in graded diagnosis and treatment in Suzhou City, with the aim of providing evidence-based recommendations to enhance their participation and inform policy development.

Methods: In June 2022, we conducted a multi-stage convenience sampling survey of 1,451 general practitioners across 175 primary healthcare institutions in Suzhou's four counties and six districts using a self-developed questionnaire. The instrument comprised two sections: (1) demographic characteristics of participants, and (2) factors influencing willingness to participate in graded diagnosis and treatment. The latter section was developed based on an expanded model integrating the Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM), supplemented by literature review and expert interviews. Structural Equation Modeling (SEM) was employed to assess model fit, while exploratory factor analysis determined the relative weight of each influencing factor.

Results: Of the 1,451 general practitioners surveyed, 1,302 valid questionnaires were collected (response rate: 89.73%). The expanded model demonstrated good fit. Participation attitude, subjective norms, and perceived behavioral control collectively influenced willingness to participate, with weights of 46.22%, 9.75%, and 44.02%, respectively. Participation attitude was explained by perceived benefits (15.14%) and perceived usefulness (31.08%). Perceived behavioral control was explained by disposable resources (27.07%) and expected

resistance (16.95%).

Conclusion: General practitioners' recognition of higher-level hospitals' service capacity, the complexity of referral procedures, and the degree of access to medical resources from higher-level hospitals significantly impact their willingness to participate in graded diagnosis and treatment. We recommend multi-level interventions: strengthening personnel exchanges within medical consortia, leveraging information technology to streamline referral processes, and encouraging higher-level hospitals to provide prioritized access to outpatient appointments and inpatient beds for general practitioners. These measures can enhance participation willingness and support effective policy implementation.

Keywords: General practitioner; Primary healthcare institutions; Graded diagnosis and treatment; Willingness to participate; Theory of planned behavior; Technology acceptance model; Structural equation model; Exploratory factor analysis

Introduction

Graded diagnosis and treatment refers to the stratification of diseases based on severity, urgency, and treatment complexity, with different levels of medical institutions assuming responsibility for corresponding disease categories. This approach aims to clarify institutional roles and facilitate rational healthcare-seeking behavior [1]. As a cornerstone of healthcare reform and the Healthy China strategy, graded diagnosis and treatment can effectively improve the efficiency of medical resource allocation and enhance the overall performance of the healthcare service system [2, 3]. In August 2016, President Xi Jinping identified the "graded diagnosis and treatment system" as the top priority among essential healthcare system reforms at the National Health and Wellness Conference. Research indicates that 80-90% of medical problems can be resolved by general practitioner teams at primary healthcare institutions [4, 5].

The 2015 State Council document "Guiding Opinions on Promoting the Construction of a Graded Diagnosis and Treatment System" (Guo Ban Fa [2015] No. 70) set a target that primary healthcare institutions would account for over 65% of total patient visits by 2017. However, according to the National Health Commission's annual statistical bulletins, the proportion of primary care visits was 56.4% in 2015, declining to 55.1%, 54.2%, 53.1%, 52.0%, 53.2%, and 50.2% in subsequent years through 2021, demonstrating an overall downward trend and indicating that graded diagnosis and treatment has not achieved its intended outcomes [6].

The development of any healthcare initiative requires holistic planning that considers both demand-side (patient) needs and supply-side (healthcare provider) motivation. Only when provider enthusiasm is mobilized and scientifically guided can patients truly benefit [7]. Existing literature has predominantly

focused on the demand side, including studies on factors influencing patients' choice of primary care [8-10] and research on medical consortia and graded diagnosis and treatment [11-13]. However, as providers of primary care, referrers of complex cases, and receivers of postoperative patients transferred from higher-level hospitals for community rehabilitation, general practitioners' willingness to participate directly affects the implementation of graded diagnosis and treatment—yet few studies have examined this critical factor [14].

Among behavioral intention theories, the Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM) have been widely applied. The TPB model comprises five variables: attitude toward behavior, subjective norms, perceived behavioral control, behavioral intention, and actual behavior. According to this theory, behavior is influenced by behavioral intention, which is jointly determined by attitude, subjective norms, and perceived behavioral control. Perceived behavioral control also directly influences actual behavior, though this effect is not significant. The TAM model similarly includes five variables: actual behavior, behavioral intention, attitude, perceived usefulness, and perceived ease of use. In this model, actual behavior is influenced by behavioral intention, which is determined by perceived usefulness and attitude. Attitude is jointly affected by perceived usefulness and perceived ease of use, with perceived ease of use also directly influencing perceived usefulness.

This study uses Suzhou City as a case example to develop an expanded model based on the TPB/TAM fusion framework, supplemented by literature review and expert interviews. We investigate factors influencing general practitioners' willingness to participate in graded diagnosis and treatment, analyze these factors' relative importance, and provide recommendations to enhance participation and inform policy development.

Methods

1.1 Study Participants

1.1.1 Interview Subjects In May 2022, our research team conducted telephone interviews with nine key informants, including officials from health administrative departments, managers of primary healthcare institutions, general practitioners, and related practitioners (Table 1). Each interview lasted 15-30 minutes.

1.1.2 Survey Respondents In June 2022, we administered an online survey to 1,451 general practitioners across 175 primary healthcare institutions in Suzhou's 10 counties/districts. Inclusion criteria were: (1) licensed general practitioners (including standardized training graduates, physicians who completed conversion training from other specialties, and 定向免费培养全科医师), and (2) informed consent to participate. Exclusion criteria were unwillingness to participate in the survey.

1.2 Survey Instrument and Procedures

1.2.1 Survey Tool Development This study examined general practitioners' willingness to participate in graded diagnosis and treatment by integrating TPB and TAM to construct a TPB/TAM fusion model. We conducted literature searches using CNKI and VIP databases with keywords "general practitioner," "graded diagnosis and treatment," and "participation willingness" to identify influencing factors. Based on the TPB/TAM fusion model, we conducted semi-structured interviews to gather additional factors affecting participation willingness. Literature-derived and interview-derived factors were supplemented and merged to achieve theoretical saturation. The research team discussed and analyzed these merged factors, incorporating them into the TPB/TAM fusion model to develop an expanded model of factors influencing general practitioners' willingness to participate in graded diagnosis and treatment.

Using this expanded model, we developed questionnaire items measuring willingness to participate, combined with basic demographic questions, to create the final survey instrument.

1.2.2 Survey Administration We administered the survey online via Wenjuanxing (https://www.wjx.cn/). The research team sent QR codes to contact persons in each of the 10 counties/districts, who forwarded them to responsible persons at primary healthcare institutions. These individuals then distributed the QR codes to general practitioner work groups, inviting voluntary participation.

1.2.3 Quality Control We ensured data quality through several measures: scientifically developing the questionnaire with clear item explanations; establishing a contact person system with support from county/district health administrative officials to facilitate communication and monitor response progress; and excluding invalid questionnaires based on completion time (<5 seconds per item) and logical inconsistencies across multiple thematic sections.

1.2.4 Analytical Approach We used literature review and interviews to refine the TPB/TAM fusion model and construct the expanded model of influencing factors. Structural Equation Modeling (SEM) tested the model fit, while exploratory factor analysis calculated factor weights, with the number of factors set according to the validated expanded model.

1.3 Statistical Analysis

Survey data were uploaded to SPSSAU (https://spssau.com/) for statistical analysis. Descriptive statistics (frequencies, percentages) summarized demographic data. SEM assessed model fit of the expanded influencing factors model, and exploratory factor analysis calculated factor weights.

Results

2.1 Literature Review and Interview Findings

Literature review identified the following factors and measurement items: referral procedures [15], referral criteria [15-16], scope of higher-level hospital services, capacity of higher-level hospitals [17], organizational support [14, 18-19], performance incentives [20], and policy environment [16].

Interviews revealed additional factors: ability to schedule higher-level hospital services (ward rounds, consultations, beds, examinations, appointments); clear referral criteria; hospital environment; time and cost implications post-referral; workload changes; personal income changes; expert resource accumulation; professional achievement; patient recognition; referral procedure simplicity; emergency response capabilities of higher-level hospitals; and public recognition of graded diagnosis and treatment. Interviewees also suggested indicators to evaluate participation willingness: personal participation in graded diagnosis and treatment, and willingness to recommend the approach to colleagues and patients.

The research team determined that workload changes, income changes, and performance incentives could be subsumed under organizational support and policy environment. The combined literature and interview data achieved theoretical saturation regarding factors influencing general practitioners' participation willingness.

2.2 Model Construction

Based on these findings, we refined the TPB/TAM fusion model to develop the expanded model of factors influencing general practitioners' willingness to participate in graded diagnosis and treatment (Figure 4).

2.3 Questionnaire Development

The expanded model informed the development of questionnaire items, which were combined with demographic questions to create the final instrument. After pilot testing and expert review, the questionnaire comprised two sections: (1) basic demographics (institution type, gender, age, education, professional title, management position); and (2) factors influencing participation willingness, including 20 items measuring: appointment scheduling for ward rounds, consultations, beds, examinations, and registration; referral criteria; hospital environment; post-referral time and cost; expert resources; professional achievement; patient recognition; referral procedures; emergency response capabilities; scope and capacity of higher-level hospital services; organizational support; policy environment; and social recognition. Three additional items measured participation willingness: personal participation, recommendation to colleagues, and recommendation to patients. All items used a 5-point Likert scale (1="strongly

disagree" to 5="strongly agree"). The scale demonstrated excellent reliability (Cronbach's α=0.982) and validity (KMO=0.979, p<0.001).

2.4 Survey Results

2.4.1 Participant Characteristics Of 1,451 general practitioners who participated, 1,302 valid questionnaires were collected (89.73% response rate). Participants were distributed across community health centers (35.48%), township health centers (31.34%), and nursing homes (33.18%). Most were female (76.88%), aged 25-34 years (39.02%), with college/bachelor's degrees (84.95%), junior professional titles (41.71%), and 28.73% held management positions (Table 2).

2.4.2 SEM Analysis Results The expanded model showed good fit: RMSEA and SRMR <0.1, RMR <0.05, and GFI, CFI, NFI, NNFI, TLI, and IFI all >0.90 (Table 3). The model structure specified that participation attitude, subjective norms, and perceived behavioral control explained participation willingness; disposable resources and expected resistance explained perceived behavioral control; perceived ease of use and perceived usefulness combined to form perceived usability; and perceived benefits and perceived usability explained participation attitude. Disposable resources were measured by five items (appointment scheduling for ward rounds, consultations, beds, examinations, registration); expected resistance by four items (referral criteria, hospital environment, post-referral time and cost); perceived benefits by three items (expert resources, professional achievement, patient recognition); perceived usability by five items (referral procedures, emergency response capabilities, scope and capacity of higher-level hospital services); subjective norms by three items (organizational support, policy environment, social recognition); and participation willingness by three items (personal participation, recommendation to colleagues, recommendation to patients).

2.4.3 Exploratory Factor Analysis Results Since the expanded model demonstrated good fit, we extracted five factors in the exploratory factor analysis, which explained 85.988% of total variance (Table 4). Factor weights were calculated as: Factor 1 (perceived usability)=31.08%, Factor 2 (disposable resources)=27.07%, Factor 3 (expected resistance)=16.95%, Factor 4 (perceived benefits)=15.14%, and Factor 5 (subjective norms)=9.75%. All item communalities exceeded 0.4, indicating strong associations between items and factors. The 20 items loaded onto five factors consistent with the expanded model, validating its structure.

Based on these results, the relative influence on participation willingness was: participation attitude (46.22%), perceived behavioral control (44.02%), and subjective norms (9.75%). Participation attitude was determined by perceived usability (31.08%) and perceived benefits (15.14%), while perceived behavioral

control was determined by disposable resources (27.07%) and expected resistance (16.95%) (Figure 5).

Discussion

Our findings indicate that, excluding participation attitude and perceived behavioral control, the factors influencing general practitioners' willingness to participate in graded diagnosis and treatment, in descending order of importance, are: perceived usability (31.08%), disposable resources (27.07%), expected resistance (16.95%), perceived benefits (15.14%), and subjective norms (9.75%).

Perceived usability—encompassing referral procedure simplicity, scope and capacity of higher-level hospital services, and emergency response capabilities—exerts the strongest influence. Research shows most general practitioners believe graded diagnosis and treatment increases medical risk [21]. Since referred patients typically present complex conditions requiring advanced care, practitioners need confidence that higher-level hospitals can meet these needs. For patients transferred from higher-level hospitals for community rehabilitation, strong hospital capabilities facilitate smoother transitions and timely consultation when issues arise. Simplified referral procedures through information technology are also crucial. As general practitioners serve as core providers of comprehensive, continuous health services in primary care settings [7], their heavy workloads make streamlined processes essential.

Disposable resources—the ability to prioritize appointments for consultations, examinations, beds, and registration at higher-level hospitals—represents the second most important factor. In collaborative graded diagnosis and treatment, when referred patients cannot secure appointments or beds, negative consequences often fall on the referring general practitioner. Without prioritized resource access, practitioners may be reluctant to participate actively.

Expected resistance, perceived benefits, and subjective norms also influence participation willingness, though to a lesser degree.

Recommendations

We propose interventions at three levels:

Administrative Level: (1) Leverage the 2023 national implementation of county-level medical consortia to strengthen urban medical consortium and county medical community development; (2) Promote regional information platform construction to simplify referral processes; (3) Publicize general practitioners' role as health "gatekeepers" and promote graded diagnosis and treatment policies to foster public cooperation.

Organizational Level: (1) Enhance communication and collaboration within medical consortia through staff exchanges, continuing education, and mobile

medical services to build trust and mutual understanding; (2) Establish green-channel systems providing general practitioners with targeted, quantitative access to medical resources from higher-level hospitals; (3) Implement regular consortium meetings to address coordination issues; (4) Develop effective performance incentive systems, as 71.7% of healthcare workers report increased workload without corresponding salary adjustments following graded diagnosis and treatment implementation [22].

Individual Practitioner Level: (1) Develop thorough understanding of graded diagnosis and treatment policies; (2) Continuously improve clinical competencies to provide precise services; (3) Maintain positive service attitudes, engage in family doctor contract services, and build community trust to facilitate graded diagnosis and treatment.

Limitations

This cross-sectional study captures general practitioners' participation willingness at a single time point. The non-random, online sampling method limits generalizability. Additionally, while we used multiple methods to identify influencing factors, some potential factors may have been overlooked.

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