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Community Health Service Quality Evaluation for Multimorbidity Patients Based on the Ratchet Effect: The Moderating Role of Medical Insurance (Postprint)

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Abstract

Background: Multimorbidity has emerged as a significant characteristic in the trajectory of chronic disease progression. Community health service-based approaches to chronic disease management are widely recognized as one of the most cost-effective solutions, with the quality of community health services directly impacting diagnostic and therapeutic outcomes for patients with multimorbidity. The ratchet effect facilitates behavioral research, providing valuable insights for evaluating community health service quality for patients with multimorbidity from a physician-patient behavior perspective. Objective: To investigate the factors influencing patients with multimorbidity in their evaluation of community health service quality based on the ratchet effect. Methods: This study employed a multi-stage sampling method to select eligible patients with multimorbidity from 18 communities in Guangzhou, Guangdong Province, between July and August 2023. The PCAT scale developed by the Johns Hopkins University Primary Care Center was utilized for the community health service quality evaluation questionnaire survey. A multiple linear regression model was constructed to examine the influence and magnitude of the ratchet effect on patients with multimorbidity evaluating community health service quality under the moderating effect of medical insurance. Results: A total of 282 subjects were enrolled, comprising 129 males and 153 females, with a mean age of (38.0$±8.0)*years.Themajorityweremarried*(165, 58.51±$13.63). Statistically significant differences in PCAT scale scores were observed among patients with different monthly incomes and health status (P<0.05). Significant differences were also found in PCAT scale scores based on different levels of familiarity between community health service institutions and patients with multimorbidity (P<0.05). Patients with multimorbidity exhibiting different primary care seeking intentions showed statistically significant differences in PCAT scale

scores (P<0.05). Medical insurance demonstrated a positive moderating effect on patients with multimorbidity evaluating community health service quality (P<0.05). Under the moderating effect of medical insurance, physician-patient medical behavior indicators exhibited a ratchet effect on patients with multimorbidity evaluating community health service quality; specifically, higher familiarity of community health service institutions with patients with multimorbidity and stronger primary care seeking intentions among patients were associated with higher evaluations of community health service quality, demonstrating a phenomenon of continuous increase without decline. Conclusion: Medical insurance can enhance patients with multimorbidity's evaluation of community health service quality. The government should continue to implement people-friendly medical insurance policies to improve the healthcare experience of patients with multimorbidity, while simultaneously advocating for the establishment of effective bidirectional communication between physicians and patients. Furthermore, continued efforts are needed to strengthen patients with multimorbidity's awareness of first-contact care at the primary care level.

Full Text

Introduction

Chronic diseases have emerged as a major global health threat in the 21st century. With the accelerated aging of the population, the prevalence of chronic diseases in China has shown a significant upward trend, and the phenomenon of "one person with multiple diseases" has become increasingly common. Multiple chronic conditions have become an important characteristic of chronic disease development. A large-scale epidemiological survey in China found that 46.5% of chronic disease patients suffer from multiple chronic conditions [1]. Community health service-based approaches to chronic disease management have been widely recognized as one of the most cost-effective solutions [2], and the quality of these services directly affects public well-being. Regardless of how community health services evolve, the key dimensions of quality evaluation—first contact, continuity, comprehensiveness, coordination, and human-centered care—remain central to assessing community health service quality [3-4]. While existing research on community health service quality evaluation has been substantial, it has primarily focused on three aspects: evaluation scale development, status quo analysis, and influencing factors. However, research examining community health service quality from the perspective of doctor-patient relationship behaviors remains relatively limited. Under the influence of various policies, patients' psychological evaluations of community health service quality exhibit a tendency toward upward adjustment rather than downward adjustment, demonstrating an irreversibility known as the ratchet effect [8]. This study focuses on patients with multiple chronic conditions, utilizes the PCAT scale as its research instrument, and investigates the influencing factors of community health service quality evaluation from a doctor-patient relationship perspective based on the ratchet effect, thereby providing a reference for improving community health

service quality.

1.1 Study Subjects

This study targeted patients with multiple chronic conditions in Guangzhou. Using a multi-stage sampling method from July to August 2023, we first selected six districts (Tianhe, Yuexiu, Liwan, Haizhu, Huangpu, and Panyu) through simple random sampling based on Guangzhou' s administrative divisions. From each district, three community health service centers were randomly selected as sources of study subjects, yielding a total of 18 communities. Subsequently, several patients with multiple chronic conditions were selected from each community health service center using convenience sampling. Inclusion criteria were: (1) meeting the chronic disease criteria in the ICD-10 manual and having been diagnosed with at least two chronic conditions in a grade II or higher hospital; (2) taking five or more medications; (3) having stable vital signs and clear consciousness; and (4) providing informed consent and voluntary participation. Exclusion criteria were: (1) cognitive or language functional impairments; and (2) unclear consciousness or mental disorders. This study was approved by the Institutional Review Ethics Committee of the Affiliated Hospital of Guangdong Medical University (Ethics No.: PJ2021-121).

1.2 Survey Instruments

The PCAT scale developed by the Johns Hopkins Primary Care Center was used for community health service quality evaluation [9]. The PCAT scale covers seven dimensions and 39 items: first contact, continuity, coordination, comprehensiveness, family-centeredness, community orientation, and cultural competence. Each item has five response options: "definitely not," "generally not," "possibly," "definitely," and "uncertain," scored as 1, 2, 3, 4, and 2.5 points, respectively. Missing items were assigned 2.5 points. The total score was the sum of all dimension scores, with higher scores indicating higher community health service quality evaluation. According to the scale manual, the total score directly reflects patients' overall evaluation of community health service quality.

1.3 Survey Process and Quality Control

With respondents' consent, on-site surveys were conducted. After investigators introduced the relevant information, respondents anonymously completed the questionnaires, which were collected on-site. The scale contains 39 items. Following the principle of having 7 times the number of scale items (5–10 times is appropriate) for sample size calculation, 273 questionnaires were needed. After a 20% expansion, 356 questionnaires were ultimately distributed, with a 100% response rate. Questionnaires with incomplete or logically inconsistent information were excluded, yielding 282 valid questionnaires.

1.4 Research Design

1.4.1 Research Hypotheses

(1) Ratchet Effect of Community Health Service Institution Familiarity with Multiple Chronic Disease Patients on Service Quality Evaluation. First-system thinking is a cognitive pattern where actions control thoughts [10]. When community health service institutions demonstrate high familiarity with multiple chronic disease patients, these patients tend to give higher quality evaluations, representing a typical cognitive bias. Based on the ratchet effect, as community health service institutions' familiarity with multiple chronic disease patients increases, patients exhibit a pattern of rising rather than falling quality evaluations. Therefore, Hypothesis 1 is proposed: High familiarity of community health service institutions with multiple chronic disease patients will enhance patients' evaluation of community health service quality.

(2) Ratchet Effect of Multiple Chronic Disease Patients' Primary Care Intention on Service Quality Evaluation. Multiple chronic disease patients have established contracted service agreements with community health service institutions, incorporating a spirit of contract (or agreement-based arrangement) into medical behaviors [11]. This creates a "transaction relationship" that allows patients to access more medical services. In practice, a bidirectional influence exists between patients' primary care intention and their experience at community health service institutions. Stronger primary care intention often leads to better medical experiences, which in turn reinforces patients' primary care seeking behavior. Consequently, in the process of evaluating medical service quality, multiple chronic disease patients tend to upwardly adjust their evaluation of community health service institutions. Therefore, Hypothesis 2 is proposed: Multiple chronic disease patients' primary care intention will enhance their evaluation of community health service quality.

(3) Positive Moderating Effect of Medical Insurance on the Ratchet Effect in Service Quality Evaluation. At the psychological level, the ratchet effect explains that human desires continuously expand, with individuals always wanting to obtain more [12]. In actual medical seeking behavior, due to medical insurance involvement, multiple chronic disease patients can access more medical services at limited cost. Under normal circumstances, there already exists an upward adjustment tendency without downward adjustment in community health service quality evaluation. Moreover, in the process of evaluating community health service quality, the positive moderating effect of medical insurance also demonstrates a phenomenon of rising rather than falling evaluations [13]. Based on this, this study uses the ratchet effect to explain the irreversible phenomenon of multiple chronic disease patients' evaluation of community health service quality under the positive moderation of medical insurance policy. Therefore, Hypothesis 3 is proposed: Medical insurance will positively moderate the relationship between doctor-patient medical behaviors and community health service quality evaluation.

1.4.2 Model Construction

This study constructed a multiple linear regression model with moderating effects to examine the ratchet effect of community health service institutions' familiarity with multiple chronic disease patients and patients' primary care intention on service quality evaluation under the moderating effect of medical insurance. The models are as follows:

$$Y = a_0 + a_{1x}1 + a_{3x}3 + a_{13}x_1 * x_3 + a_{4x}4 + a_{5x}5 + \varepsilon$$

$$Y = a_0 + a_{2x}2 + a_{3x}3 + a_{23}x_2 * x_3 + a_{4x}4 + a_{5x}5 + \varepsilon$$

Where Y is the dependent variable (community health service evaluation), x_1 is the independent variable (community health service institution familiarity with multiple chronic disease patients), x_2 is the independent variable (multiple chronic disease patients' primary care intention), x_3 is the moderating variable (medical insurance status), x_4 is the control variable (health status), x_5 is the control variable (monthly income), a_i $(i = 1, 2, 3, 4, 5)$ are variable coefficients, a_0 is the intercept, and ε is the random error. The moderating effect is expressed through interaction terms. Under the main effect of x_1 or x_2 on dependent variable Y, if the interaction terms $x_1 * x_3$ or $x_2 * x_3$ significantly affect Y $(P < 0.05)$, the moderating effect of x_3 exists. When the regression coefficient B of the interaction term is positive, the moderating variable x_3 strengthens the relationship between x_1 or x_2 and dependent variable Y.

1.4.3 Model Variables and Assignment

The assignment of the dependent variable (Y), independent variables (x_1, x_2), moderating variable (x_3), and control variables (x_4, x_5) in this study is shown in Table 1 .

1.5 Statistical Methods

EpiData was used to establish the database for data entry and management. SPSS 26.0 statistical software was used for data analysis. General demographic data were described statistically. Univariate analysis was conducted on community health service quality evaluations among different categories of multiple chronic disease patients. Multiple linear regression analysis was performed on multiple chronic disease patients' evaluation of community health service quality under the moderation of medical insurance. When the B value was positive, it indicated that the moderating effect only increased without decreasing, demonstrating a significant ratchet effect. Statistical significance was set at $P < 0.05$.

2.1 Basic Characteristics of Patients

Among the 282 patients, 129 were male and 153 were female, with a male-to-female ratio of 1:1.19, indicating a relatively balanced distribution. The average age was (38.0 ± 8.0) years, with 248 patients (87.94%) under 60 years old. The majority were married (165 patients, 58.51%). Local residents predominated, with 215 patients (76.24%) having local household registration. Educational background was evenly distributed: 64 patients (22.69%) had junior high school education or below, 106 (37.58%) had high school or vocational education, and 112 (39.73%) had undergraduate or postgraduate education. Overall income levels were relatively low, with 163 patients (57.80%) having monthly incomes below 5,000 yuan. Overall health status was good, with 242 patients (85.81%) rating their health as good or very good. The vast majority had public medical insurance, urban employee social insurance, or urban resident social insurance (239 patients, 84.75%), 12 patients (4.26%) had new rural cooperative medical insurance, and 29 patients (10.28%) had no insurance. Details are shown in Table 2 .

2.2 Univariate Analysis Results

The PCAT score for multiple chronic disease patients was (104.47 ± 13.63) points. No statistically significant differences in PCAT scores were found across gender, age, marital status, or education level ($P > 0.05$). However, statistically significant differences were observed in PCAT scores across different monthly income levels and health statuses ($P < 0.05$). Additionally, PCAT scores differed significantly based on community health service institutions' varying levels of familiarity with multiple chronic disease patients ($P < 0.05$), and among patients with different primary care intentions ($P < 0.05$). See Table 3 for details.

2.3 Moderated Effects Analysis

2.3.1 Ratchet Effect of Familiarity Under Medical Insurance Moderation

Using residents' PCAT scores as the dependent variable, medical insurance as the moderating variable, community health service institutions' familiarity with multiple chronic disease patients as the independent variable, and health status and income level as control variables, the statistical analysis results showed that the multiple linear regression model had $R^2 = 0.333$, $P < 0.001$, and all variance inflation factor (VIF) values were less than 5, indicating no multicollinearity. The model results showed that the interaction term between multiple chronic disease patients' primary care intention (x_2) and medical insurance type (x_3) had a statistically significant effect on community health service quality evaluation (Y) ($P < 0.05$), with a positive interaction term regression coefficient, indicating the presence of a medical insurance moderating effect. Specifically, under the moderating effect of medical insurance, community health service institutions' familiarity with multiple chronic disease patients and community health service

quality evaluation showed a positive moderating relationship. When medical insurance was involved, higher familiarity of community health service institutions with multiple chronic disease patients led to higher evaluations of community health service quality. See Table 4 for details. In terms of the sign of the B value, this moderating effect only increased without decreasing, demonstrating a significant ratchet effect. Therefore, under the moderating effect of medical insurance, a ratchet effect exists between community health service institutions' familiarity with multiple chronic disease patients and community health service quality evaluation. These results verified Hypotheses 1 and 3 in Section 1.4.1. Moreover, in terms of the magnitude of the B value, the effect of community health service institutions' familiarity on community health service quality evaluation was stronger under the moderating effect of medical insurance.

2.3.2 Ratchet Effect of Primary Care Intention Under Medical Insurance Moderation

Using residents'PCAT scores as the dependent variable, medical insurance as the moderating variable, multiple chronic disease patients' primary care intention as the independent variable, and health status and income level as control variables, the statistical analysis results showed that the multiple linear regression model had $R^2 = 0.305$, $P < 0.001$, and all VIF values were less than 5, indicating no multicollinearity. The model results showed that the interaction term between community health service institutions' familiarity with multiple chronic disease patients (x_1) and medical insurance type (x_3) had a statistically significant effect on community health service quality evaluation (Y) ($P < 0.05$), with a positive interaction term regression coefficient, again indicating the presence of a medical insurance moderating effect. In other words, multiple chronic disease patients with medical insurance who had stronger primary care intentions gave higher evaluations of community health service quality. See Table 5 for details. In terms of the sign of the B value, this moderating effect only increased without decreasing, demonstrating a significant ratchet effect. Therefore, under the moderating effect of medical insurance, a ratchet effect exists between multiple chronic disease patients' primary care intention and community health service quality evaluation. These results verified Hypotheses 2 and 3 above. Moreover, in terms of the magnitude of the B value, the effect of multiple chronic disease patients' primary care intention on community health service quality evaluation was stronger under the moderating effect of medical insurance.

Discussion

3.1 Medical Insurance Can Enhance Quality Evaluation Among Patients with Multiple Chronic Conditions

Under the guidance of medical insurance policy, each doctor-patient behavior indicator influences community health service quality evaluation, thereby verifying the positive moderating effect of medical insurance on the relationship between doctor-patient medical behaviors and community health service quality

evaluation. This can be considered the primary pathway driving improvements in community health service quality evaluation, which aligns with the original intention of the national medical insurance system: to protect citizens' basic medical rights and interests, achieve mutual assistance in medical resources, and improve medical standards and service quality. Due to the desire expansion characteristic of the ratchet effect, multiple chronic disease patients always hope to obtain more benefits from medical insurance reimbursement channels. When these benefits meet their needs, the positive moderating effect becomes clearly evident. Obviously, medical insurance promotes and enhances the first-contact, accessibility, and coordination services of community health services [14], which is closely related to medical insurance' s inherent function of reducing patients' financial risks [15]. This suggests that, from a government perspective, more beneficial medical insurance reimbursement policies should be introduced to strengthen community health service orientation, improve multiple chronic disease patients' medical experience, and reduce interference from economic and other factors in community health service quality evaluation [16].

3.2 Two-Way Communication is an Effective Pathway to Influence Quality Evaluation

This study empirically demonstrates the ratchet effect that higher familiarity of community health service institutions with multiple chronic disease patients leads to higher patient evaluations of community health service quality, which can be termed "communication value-added." We believe that under medical insurance orientation, community health service institutions should enhance their communication value-added capabilities with multiple chronic disease patients, which should be regarded as an effective pathway to improve community health service quality. This precisely suggests that, from the community health service institution perspective, there should be active and in-depth analysis of local medical insurance policies, integration of more doctor-patient relationship behavior indicators, and continued exploration of the impact of doctor-patient relationship behaviors on community health service quality evaluation based on the ratchet effect.

3.3 Primary Care First Contact is an Important Channel Influencing Quality Evaluation

There is a certain association between multiple chronic disease patients' long-term visits to a fixed community health service institution and community health service quality evaluation. This study' s results verify the ratchet effect between these two factors. Based on the widespread implementation of Guangdong Province' s family doctor contract system, which has achieved relatively ideal results [18]—particularly demonstrated by the substantial increase in patients' primary care visit rates [19]—we observed in actual cases that after repeated contact with community health service institutions, patients experience chronic disease diagnosis, treatment, and health management services, leading

to improved patient experience and consequently higher community health service quality evaluations. It is well known that community health service-based chronic disease diagnosis and treatment is the most cost-effective solution [2]. Under current conditions of continuously improving community health service quality, we should use multiple channels such as physical posters and online articles to further advocate for multiple chronic disease patients to seek primary care.

3.4 Limitations and Future Directions

This study has several limitations that warrant further investigation. First, due to practical survey constraints and issues with some indicators, this study did not examine the two doctor-patient relationship behavior indicators in the same model. In future research, we could attempt to include both doctor-patient relationship behavior indicators in a single model, or even introduce more doctor-patient relationship indicators to explore the ratchet effect of richer indicators on community health service quality evaluation. Second, this study used multiple chronic disease patients in Guangzhou as research subjects to explore the ratchet effect of doctor-patient relationship behavior indicators on community health service quality evaluation. The data may have common source bias, and its impact on analysis results requires attention. In future research, we could expand the geographic diversity of study subjects and increase the sample size from multiple regions while maintaining relevance to the research topic. We can further expand the number of study subjects.

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