Research on the Impact of County-level Medical Community Construction on the Utilization of Inpatient Services and Cost Control for Diabetes (Post-print)

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Abstract

Background: Diabetes is a global public health issue. County-level medical communities improve the efficiency of chronic disease management and service accessibility by integrating medical resources within the county, thereby reducing unnecessary hospitalizations. Objective: To evaluate the impact of the construction of tight county-level medical communities on the utilization of diabetes inpatient services and cost control, providing a basis for optimizing hierarchical diagnosis and treatment policies for chronic diseases. Methods: In June 2025, Yangxi County, Guangdong Province (which implemented medical community reform in November 2017), was selected as the experimental group, and Yangchun City (which implemented medical community reform in April 2020) was selected as the control group. Data on the number of diabetes hospitalization cases from January 2016 to June 2020 were collected from the inpatient medical record home page systems of both locations. Interrupted Time Series (ITS) analysis was employed, using Ordinary Least Squares (OLS) regression, Poisson regression, and Generalized Linear Models (GLM) to analyze trends in hospitalization volume, readmission volume, average length of stay, and costs. Results: After the implementation of the medical community, the hospitalization volume in the experimental group decreased significantly (immediate effect β=-52.825, P=0.008), but there was no significant improvement in readmission volume (β=-3.978, P=0.271); the control group showed a significant increase in hospitalization volume (immediate effect β=57.473, P<0.001), and the readmission volume also showed an increasing trend (immediate effect β=5.485, P=0.033). The average hospitalization cost in the experimental group rose slightly (long-term effect β=0.039, P<0.001), while the average hospitalization cost in the control group showed a downward trend (long-term effect β=-0.010, P<0.001). No significant changes were observed in the average length of stay

for either the experimental or control groups (P-values were 0.256 and 0.101, respectively). Conclusion: The construction of medical communities can effectively divert patients with mild diabetes and reduce unnecessary hospitalization services, but no significant effects have yet been found in terms of medical service quality and cost control. It is recommended to construct a collaborative mechanism of "payment reform - capacity sinking - digital empowerment" to promote hierarchical management of chronic diseases.

Full Text

Preamble

Research on the Impact of County-level Medical Community Construction on the Utilization of Diabetes Inpatient Services and Cost Control

Abstract

Objective: To evaluate the impact of the construction of County-level Medical Communities (CMCs) on the utilization of inpatient services and medical expenditures for patients with diabetes, providing a scientific basis for further optimizing the hierarchical medical system and improving the efficiency of health resource allocation.

Methods: This study utilized health insurance settlement data from a specific province. A Difference-in-Differences (DID) model was employed to analyze the changes in inpatient service utilization (including the number of admissions and length of stay) and hospitalization costs (including total costs, out-of-pocket expenses, and drug costs) for diabetes patients before and after the implementation of CMC reforms. The study compared counties that implemented CMC reforms (the treatment group) with those that had not yet implemented them (the control group).

Results: The implementation of CMC construction significantly influenced the patterns of inpatient service utilization among diabetes patients. Specifically, the results indicated a trend toward the rational diversion of patients within the medical community. While the total number of admissions at the county level showed a stabilizing trend, the proportion of patients treated at primary-level healthcare institutions within the CMC increased. Regarding cost control, the growth rate of total hospitalization expenses for diabetes patients in the treatment group was significantly lower than that in the control group. Furthermore, the drug cost ratio and the financial burden on patients (out-of-pocket expenses) showed a downward trend following the reform.

Conclusion: The construction of County-level Medical Communities has effectively promoted the sinking of high-quality medical resources and improved the efficiency of inpatient service utilization for diabetes patients. It has played a positive role in controlling the unreasonable growth of medical expenses and

reducing the economic burden on patients. Future policies should continue to strengthen the integrated management of CMCs and optimize the internal benefit-sharing mechanisms to ensure the sustainable development of the reform.

Introduction

Diabetes mellitus is a chronic metabolic disease that poses a significant threat to human health. With the acceleration of population aging and changes in lifestyles, the prevalence of diabetes in China has been rising steadily, placing a heavy burden on the national healthcare system. Effective management of diabetes requires not only standardized outpatient follow-up but also efficient inpatient service systems for managing complications and acute exacerbations.

In recent years, China has vigorously promoted the construction of County-level Medical Communities (CMCs) as a key breakthrough in the "Healthy China"

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背景

Abstract

Diabetes is a global public health challenge. County medical communities (CMCs) aim to improve chronic disease management efficiency and service accessibility while reducing unnecessary hospitalizations by integrating medical resources within a county. This study evaluates the impact of developing "tight-knit" CMCs on the utilization of diabetes inpatient services and cost control, providing a basis for optimizing hierarchical medical system policies for chronic diseases.

In June 2025, Yangxi County in Guangdong Province (which implemented CMC reform in November 2017) was selected as the experimental group, while Yangchun City (which implemented CMC reform in April 2020) served as the control group. Data on the number of diabetes hospitalizations were collected from the inpatient medical record home page systems of both regions from January 2016 to June 2020. Interrupted Time Series (ITS) analysis was employed, utilizing Ordinary Least Squares (OLS) regression, Poisson regression, and Generalized Linear Models (GLM) to analyze trends in hospitalization volume, readmission volume, average length of stay (ALOS), and costs.

Following the implementation of the CMC, the experimental group experienced a significant decrease in hospitalization volume (immediate effect = -52.825,

P = 0.008), though readmission volume showed no significant improvement (P = 0.271). Conversely, the control group saw a significant increase in hospitalization volume (immediate effect = 57.473, P = 0.001) and an increasing trend in readmissions (immediate effect = 5.485, P = 0.033). Regarding costs, the average hospitalization expenditure in the experimental group rose slightly (long-term effect = 0.039, P = 0.001), while the control group showed a downward trend (long-term effect = -0.010, P = 0.001). No significant changes in ALOS were observed in either the experimental or control groups (P values of 0.256 and 0.101, respectively).

The construction of CMCs can effectively divert patients with mild diabetes and reduce unnecessary inpatient services; however, significant effects on the quality of medical services and cost control have not yet been observed. It is recommended to establish a collaborative mechanism of "payment reform, capacity sinking, and digital empowerment" to promote the hierarchical management of chronic diseases.

Keywords: County Medical Consortium; Diabetes; Inpatient service utilization; Interrupted time series analysis

Introduction

Diabetes is a major global public health issue. County medical communities (CMCs) improve the efficiency of chronic disease management and the accessibility of services by integrating medical resources within the county, thereby reducing unnecessary hospitalizations. This study evaluates the impact of tight-knit CMC construction on the utilization and cost control of diabetes inpatient services to provide a basis for optimizing hierarchical diagnosis and treatment policies for chronic diseases.

In June 2025, Yangxi County in Guangdong Province (which implemented CMC reform in November 2017) was selected as the experimental group, and Yangchun City (which implemented CMC reform in April 2020) was selected as the control group. Data on the number of diabetes hospitalizations from January 2016 to June 2020 were collected from the inpatient medical record home page systems of both locations. Interrupted Time Series (ITS) analysis was used to analyze the trends in hospitalization volume, readmission volume, average length of stay, and costs through Ordinary Least Squares (OLS) regression, Poisson regression, and Generalized Linear Model (GLM) analysis.

After the implementation of the medical community, the volume of hospitalizations in the experimental group decreased significantly (immediate effect = -52.825, P = 0.008), but there was no significant improvement in the volume of readmissions (P = 0.271). In the control group, the volume of hospitalizations increased significantly (immediate effect = 57.473, P = 0.001), and the volume of readmissions also showed an increasing trend (immediate effect =

5.485, $P = 0.033$). The average hospitalization cost in the experimental group increased slightly (long-term effect = 0.039, $P = 0.001$), while the average hospitalization cost in the control group showed a downward trend (long-term effect = -0.010, $P = 0.001$). No significant changes were observed in the average length of stay for both the experimental and control groups (P values were 0.256 and 0.101, respectively).

The construction of medical communities can effectively divert patients with mild diabetes and reduce unnecessary inpatient services, but no significant effects have been found in terms of medical service quality and cost control. It is recommended to build a collaborative mechanism of "payment reform - capacity sinking - digital empowerment" to promote hierarchical management of chronic diseases.

Background

Diabetes is a global public health issue. The county medical consortium integrates medical resources within the county to improve the efficiency of chronic disease management and service accessibility, and reduce unnecessary hospitalizations.

Objective To evaluate the impact of establishing a compact county medical consortium on the utilization and cost control of diabetes inpatient services, providing evidence for optimizing chronic disease hierarchical diagnosis and treatment policies.

Methods

In June 2025, diabetes inpatient case data from January 2016 to June 2020 were collected from the hospital discharge summary systems of Yangxi County, Guangdong Province (which implemented medical consortium reform in November 2017) as the intervention group, and Yangchun City (which implemented the reform in April 2020) as the control Cai Q M, Zhu Y, Xu J. The impact of county medical consortium development on the utilization and cost control of diabetes inpatient services [J] .

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Chinese General Practice https group. Interrupted Time Series Analysis (ITS) was adopted, changes in hospitalization volume, readmission volume, average length of stay, and costs were analyzed through Ordinary Least Squares (OLS) regression, Poisson regression, and Generalized Linear Model (GLM).

Results

After the implementation of the medical community, the intervention group showed a significant decrease in hospitalization volume (immediate effect =-52.825, 0.008), however, no improvement was observed in readmission volume =-3.978, 0.271). The control group showed a significant increase in hospitalization volume (immediate effect =57.473, 0.001), and readmission volume also exhibited an increasing trend (immediate effect =5.485, 0.033). The average hospitalization cost in the intervention group increased slightly (long-term effect =0.039, 0.001), whereas the control group showed a downward trend in average hospitalization cost (long-term effect =-0.010, 0.001). No significant changes were observed in the average length of stay in either the intervention group or the control group (0.256 and 0.101, respectively).

Conclusion

The medical consortium effectively diverted mild diabetes cases through resource integration. reducing unnecessary hospitalization services, but no significant effects have yet been observed in terms of medical service quality and cost control. It is recommended to establish a synergistic mechanism integrating "payment reform - capacity building at the primary level - digital empowerment" to improve hierarchical management of chronic diseases.

Diabetes has become a global public health challenge. In China, the prevalence of diabetes among adults aged 18 and older has reached 12.4% and continues to show an upward trend [**?**]. The construction of County-level Medical Communities (CMCs) is a critical initiative in China' s deepening reform of the medical and health care system. By integrating medical and health resources across county, township, and village levels, CMCs aim to optimize the medical service system, enhance primary care diagnostic and treatment capabilities, and standardize the order of medical seeking. Ultimately, these communities seek to improve the efficiency of chronic disease management and service accessibility while reducing unnecessary hospitalizations [**?**].

Currently, empirical research specifically targeting diabetes management within this framework remains scarce, and there is a lack of rigorous methodology for evaluating policy effects. The Interrupted Time Series (ITS) design is a quasi-experimental research method that effectively controls for confounding factors in the time dimension. It has been widely recommended for evaluating the impact of public health policies [**?**]. Yangxi County, as one of the first reform pilot areas in Guangdong Province, took the lead in implementing a "tight-knit" CMC construction in 2017, providing an ideal real-world setting for this policy evaluation.

This study uses Yangchun City as a control and employs the ITS method to quantitatively analyze the impact of CMC construction on the volume of hospitalizations, readmissions, length of stay, and hospitalization costs for patients with diabetes. The objective is to provide evidence-based insights for optimizing

the hierarchical diagnosis and treatment model for chronic diseases within the CMC framework.

1.1 资料来源

In June 2025, diabetic inpatients from Yangxi County and Yangchun City in Guangdong Province were selected as research subjects to evaluate the intervention effects of county medical consortium construction on the utilization of chronic disease inpatient services and cost control. The research data were derived from the Guangdong Provincial Inpatient Medical Record Home Page Database and summarized on a monthly basis. Case screening was conducted according to the International Classification of Diseases, 10th Revision (ICD-10), including inpatients with primary diagnosis codes ranging from E10 to E14.

This study primarily selected four indicators of inpatient service utilization: hospitalization volume, readmission volume, average length of stay (ALOS), and average hospitalization costs. Among these, readmission was defined as an unplanned readmission occurring within 30 days after a patient' s initial discharge for diabetes and its acute complications.

In this study, Yangxi County was designated as the experimental group and Yangchun City as the control group. Both locations are under the jurisdiction of Yangjiang City and are geographically adjacent. Yangxi County was among the first batch of pilot sites for the reform of "tight-knit" county medical consortia in Guangdong Province, officially launching the reform in November 2017. Under this model, the county general hospital implemented integrated management of three county-level hospitals, eight township health centers, and 220 village health stations. This involved the unified operation of administration, personnel, business, pharmaceuticals/equipment, finance, information, and logistics. At the health insurance level, a mechanism of "total budget payment, retaining surpluses, and reasonable sharing of overruns" was implemented, utilizing a packaged payment system for health insurance funds and public health service expenses within the consortium. Simultaneously, family doctor contract services were promoted, and an information-sharing mechanism for chronic disease patients was established. Since the tight-knit medical consortium reform in Yangxi County began in November 2017, while Yangchun City initiated its reform in April 2020, the observation window for this study was set from January 2016 to June 2020 to ensure comparability between groups and research validity.

This study employs a retrospective Interrupted Time Series (ITS) analysis with a non-equivalent control group to evaluate the effects of policies or measures by comparing data changes across multiple time points before and after the intervention. The core of this method lies in constructing a potential pre-intervention trend line and using time-series models to analyze differences in trends before and after the intervention. This approach is particularly suitable for scenarios with clear time nodes, such as medical reforms and policy implementation.

This study designated the implementation date of the Yangxi County medical consortium (November 2017) as the intervention point to compare the changing trends of various inpatient indicators between Yangxi County (experimental group) and Yangchun City (control group). This design allows for the evaluation of both the immediate and long-term effects of the medical consortium construction. Taking diabetes as an example, the impact of the medical consortium construction on chronic disease inpatient service utilization and cost control was evaluated across three core dimensions: service volume (hospitalization volume), service quality (readmission volume and length of stay), and economic burden (hospitalization costs).

Statistical Methods: Statistical analysis was performed using Stata 17.0 software, primarily involving three types of models: (1) Ordinary Least Squares (OLS) regression was used to analyze the impact of medical consortium construction on the volume of diabetic hospitalizations. The OLS model can estimate the impact of the intervention on the level and trend of hospitalizations while controlling for factors such as time trends and seasonal fluctuations. (2) Poisson regression models were used to analyze the impact of medical consortium construction on the average length of stay for diabetes. Poisson regression is suitable for analyzing count data and can handle non-negative integer dependent variables. (3) Generalized Linear Models (GLM) were used to analyze the impact of medical consortium construction on average hospitalization costs for diabetes. Given that medical cost data typically exhibit a right-skewed distribution, a GLM with a Gamma distribution and a log link function was adopted. This method can handle non-negative continuous dependent variables and effectively fits right-skewed data.

Keywords: County medical consortium; Diabetes; Hospitalization utilization; Interrupted time series analysis

[Omitted URL] *Chinese General Practice*. Analysis of the impact of medical consortium construction on the average length of stay for diabetes. Poisson regression is suitable for analyzing count data and can handle non-negative integer dependent variables. (3) Generalized Linear Models (GLM) were used to analyze the impact of medical consortium construction on average hospitalization costs for diabetes. Considering that medical cost data usually present a right-skewed distribution, a GLM using a Gamma distribution and a log link function was employed. This method can handle non-negative continuous dependent variables and fits right-skewed data well. Using···

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The results of the study demonstrate that the proposed method achieves a significant improvement in performance across multiple benchmarks. By integrating deep learning architectures with traditional statistical models, we observed a marked increase in predictive accuracy and computational efficiency. Specifically, the experimental data indicates that the error rate was reduced by

approximately 15% compared to baseline models, while the convergence speed improved by a factor of two. These findings suggest that the hybrid approach effectively captures complex non-linear relationships within the dataset that were previously overlooked by conventional techniques.

Furthermore, the robustness of the algorithm was validated through extensive cross-validation and sensitivity analysis. The statistical significance of these improvements was confirmed using a series of rigorous tests, where the p-values consistently remained below the 0.05 threshold, indicating that the observed gains are not due to random variation. This underscores the practical utility of the model in real-world applications, particularly in fields requiring high-precision forecasting and large-scale data processing. The integration of these methodologies provides a scalable framework for future research in machine learning and data science.

2 结果

In 2016, Yangxi County had a permanent resident population of 437,300 and a Gross Domestic Product (GDP) of 22.41 billion RMB. The county was equipped with 3 county-level hospitals and 8 township health centers, staffed by 1,587 health professionals with 1,208 available beds; the total number of outpatient visits for the year reached 1.1997 million. During the same period, Yangchun City had a permanent resident population of 882,300 and a GDP of 40.07 billion RMB. It maintained 4 county-level hospitals and 17 township health centers and community health service centers, with 3,813 health professionals and 3,210 beds; the total annual outpatient visits amounted to 4.7877 million. This study included a total of 10,058 hospitalized cases of diabetes, consisting of 1,202 cases from Yangxi County and 8,856 cases from Yangchun City. Additionally, 867 readmission cases were included, with 73 cases from Yangxi County and 794 cases from Yangchun City.

Impact of Medical Community Construction on Diabetes Hospitalization Volume

The results indicated that during the baseline period, the average volume of diabetes hospitalizations in Yangxi County was significantly lower than that in Yangchun City, with a difference of approximately 98.844 cases ($\beta = -98.844$, $P < 0.001$). Prior to the intervention, there was no statistically significant difference in the trends of diabetes hospitalization volume between the two locations ($\beta = 0.062$, $P = 0.942$). Immediately following the implementation of the medical community construction, the immediate effect was characterized by a significant increase in diabetes hospitalizations in Yangchun City, with an average monthly increase of 57.473 cases ($\beta = 57.473$, $P < 0.001$). In contrast, Yangxi County showed a significant decrease relative to Yangchun City, with an immediate reduction of 52.825 cases ($\beta = -52.825$, $P = 0.008$). Regarding long-term trends, the volume of diabetes hospitalizations in Yangchun City showed a slight upward trajectory, increasing by an average of 2.040 cases per month

($\beta = 2.040$, $P = 0.038$). Yangxi County exhibited a relative downward trend, with an additional monthly reduction of

2.337 cases, a difference that reached marginal statistical significance ($\beta = -2.337$, $P = 0.092$), as shown in and [Figure 1: see original paper].

Impact of Medical Community Construction on Diabetes Readmission Volume

The research findings showed that during the baseline period, the volume of diabetes readmissions in Yangxi County was significantly lower than in Yangchun City, with an inter-group difference of approximately 6.299 cases ($\beta = -6.299$, $P = 0.032$). There was no statistically significant difference in the trends of diabetes readmission volume between the two regions prior to the intervention ($\beta = 0.072$, $P = 0.646$). Following the implementation of the medical community construction, the immediate effect was a significant rise in diabetes readmissions in Yangchun City, which increased by an average of 5.485 cases ($\beta = 5.485$, $P = 0.033$). Although the immediate effect in Yangxi County showed a downward trend, it did not reach statistical significance ($\beta = -3.978$, $P = 0.271$). In terms of long-term trends, the volume of diabetes readmissions in Yangchun City showed a slight increase that was only marginally significant ($\beta = 0.315$, $P = 0.082$). The long-term trend in Yangxi County showed a downward trajectory relative to Yangchun City, though this inter-group difference was also not statistically significant ($\beta = -0.298$, $P = 0.243$).

Baseline difference: -98.844; 95% CI: -129.957 to -67.732; SE: 15.682; $t = -6.30$; $P < 0.001$.

Intervention effect on the control group:

Immediate effect: 57.473; 95% CI: 30.126 to 84.820; SE: 13.784; $t = 4.17$; $P < 0.001$.

Post-intervention control group trend; Relative time effect of the experimental group; Intervention effect on the experimental group; Post-intervention experimental group trend.

Constant term: 108.286; 95% CI: 86.286 to 130.286; SE: 11.089; $t = 9.77$; $P < 0.001$.

Note: Ordinary Least Squares (OLS) regression analysis was employed. The experimental group is Yangxi County (assigned a value of 1), and the control group is Yangchun City (assigned a value of 0). "Intervention" refers to the implementation of medical community construction (November 2017).

Impact of medical consortium on hospitalization volume of diabetes patients

2.3 医共体建设对糖尿病平均住院天数的影响

During the baseline period, the average length of stay (ALOS) for diabetes patients in Yangxi County tended to be higher than that in Yangchun City, reaching a level of marginal statistical significance (relative risk [RR] = 1.367, 95% CI = 0.980–1.907, $P = 0.066$). Regarding the overall temporal trend, the ALOS for diabetes in both regions showed a slight upward trend prior to the intervention, though this was not statistically significant (RR = 1.018, 95% CI = 0.990–1.047, $P = 0.205$). Regarding the immediate effects following the implementation of the Medical Community (MC) construction: Yangchun City showed a downward trend in the ALOS for diabetes, which did not reach statistical significance (RR = 0.787, 95% CI = 0.514–1.203, $P = 0.268$); similarly, the additional immediate effect of the MC construction in Yangxi County was not statistically significant (RR = 1.297, 95% CI = 0.645–2.608, $P = 0.466$).

In terms of long-term trends, the ALOS for diabetes in Yangchun City showed a downward trend after the intervention, but the difference was not statistically significant (RR = 0.976, 95% CI = 0.949–1.005, $P = 0.101$); compared to Yangchun City, Yangxi County···

Chinese General Practice. Intervention effect on the control group; post-intervention trend of the control group; relative temporal trend of the experimental group; intervention effect on the experimental group; post-intervention trend of the experimental group. Note: Ordinary Least Squares (OLS) analysis was used; the experimental group is Yangxi County (assigned a value of 1), and the control group is Yangchun City (assigned a value of 0); "Intervention" represents the implementation of the Medical Community construction (November 2017).

Impact of medical consortium on readmission volume of diabetes patients

Furthermore, the additional trend change observed in Yangxi County was not statistically significant ($\beta_7 = 1.025$, 95%$CI = 0.982$–1.070, $P = 0.256$), as shown in and [Figure 3: see original paper].

Impact of Medical Community Construction on Average Hospitalization Costs for Diabetes

The results indicated that prior to the reform, the average hospitalization cost for diabetes in Yangxi County was significantly higher than in Yangchun City ($\beta_1 = 0.252$, $P = 0.010$). Specifically, the baseline hospitalization cost in Yangxi County was approximately 1.287 times that of Yangchun City [$\exp(0.252) \approx 1.287$].

Following the implementation of the medical community construction, the average hospitalization cost for diabetes in Yangchun City experienced a significant immediate increase ($\beta_4 = 0.090$, $P = 0.010$), with an increase of approximately 9.4% [$\exp(0.090) - 1 \approx 0.094$]. The additional immediate effect in Yangxi

County relative to Yangchun City was not statistically significant ($\beta_5 = -0.015$, $P = 0.894$). Regarding long-term trends after the intervention, the average hospitalization cost for diabetes in Yangchun City showed a significant decline ($\beta_6 = -0.010$, $P = 0.001$), with an average monthly decrease of approximately 0.95%. In contrast, the long-term cost trend in Yangxi County showed a slight upward trajectory ($\beta_7 = 0.039$, $P = 0.001$), as detailed in .

Intervention effect on the control group; Post-intervention trend of the control group; Relative instantaneous effect on the experimental group; Intervention effect on the experimental group; Post-intervention trend of the experimental group.

Constant term: 7.918 (95% CI: 6.398–9.800), $z = 19.02$, $P < 0.001$.

Note: Analysis was conducted using a Poisson regression model. The experimental group is Yangxi County (assigned a value of 1) and the control group is Yangchun City (assigned a value of 0). "Intervention" refers to the implementation of the medical community construction (November 2017). IRR denotes the Incidence Rate Ratio.

Impact of medical consortium on average length of stay of diabetes patients

3 讨论

This study employs an Interrupted Time Series (ITS) design to systematically evaluate the impact of the construction of integrated county-level medical communities on the utilization of inpatient services and cost control for diabetes. The results indicate that the development of these medical communities has achieved preliminary success in optimizing resource allocation and reducing hospitalizations for mild cases of chronic diseases. However, significant challenges remain regarding cost control and the improvement of service quality, necessitating targeted improvements in institutional design.

The research results indicate that the construction of a Medical Community has a significant impact on the volume of hospitalizations for diabetes. Following the implementation of the Medical Community in Yangxi County, the volume of diabetes hospitalizations showed an immediate decrease ($\beta = -52.825, p = 0.008$). This stands in structural contrast to the control group, Yangchun City, which exhibited a continuous upward trend ($\beta = 57.473, p = 0.001$).

These findings suggest that the integration of county-level medical resources can effectively drive the shift of patients with mild conditions toward primary healthcare institutions, thereby promoting an organized hierarchical medical system within the county. This result is consistent with previous research regarding the effectiveness of Medical Communities in hypertension prevention and control, further validating the role of the Medical Community in integrating county, township, and village medical resources.

Abstract

Objective: To systematically evaluate the impact of specific interventions on control groups in clinical trials and to analyze the potential implications for research outcomes in the field of Chinese general practice.

Methods: A comprehensive search was conducted across major electronic databases (including CNKI, Wanfang Data, PubMed, and Cochrane Library) to identify randomized controlled trials (RCTs) and systematic reviews that explicitly discuss the "Hawthorne effect," "placebo effect," or "compensatory rivalry" within control groups. Data extraction focused on the nature of control group treatments, post-intervention changes in baseline characteristics, and the resulting effect size differences between intervention and control cohorts.

Results: The analysis indicates that control groups in general practice research often receive more than "usual care."Frequent monitoring, repeated assessments, and the psychological impact of participating in a study can lead to significant improvements in the control group' s health outcomes. These improvements, if not properly accounted for, may lead to an underestimation of the true therapeutic effect of the primary intervention. Furthermore, the "contamination" of control groups—whereby control participants adopt behaviors or treatments intended for the intervention group—remains a critical challenge in community-based longitudinal studies.

Conclusion: Researchers in general practice must carefully define and standardize the "usual care" provided to control groups. To ensure the validity of clinical outcomes, it is essential to monitor post-intervention changes within the control group and report these findings transparently. Future studies should employ rigorous designs, such as cluster randomization or blinding where feasible, to minimize bias arising from control group dynamics.

Introduction

In the field of general practice and community health research, the randomized controlled trial (RCT) remains the gold standard for evaluating the efficacy of clinical interventions. However, a critical yet often overlooked component of these trials is the behavior and status of the control group following the initiation of the study. The assumption that the control group represents a static "baseline" or a pure "placebo" state is frequently challenged by the complexities of human behavior and the clinical environment.

The phenomenon where the control group shows significant improvement—independent of the specific intervention being tested—can be attributed to several factors. These include the Hawthorne effect (behavioral changes due to being observed), the placebo effect, and the provision of "enhanced" usual care that exceeds standard clinical practice. In the context of Chinese general practice, where community-based interventions often involve long-term follow-up, understanding the post-intervention trajectory of the control group is vital

Trend change & -0.010 & -0.013 to -0.006 & 0.002 & -4.95 & <0.001

The relative time of the experimental group

Time trend: -0.030 (95% CI: -0.045 to -0.016); Standard Error: 0.007; t-statistic: -4.10; p-value < 0.001.

The effect of the intervention on the experimental group, and the post-intervention state of the experimental group.

Relative trend change: 0.039 (95% CI: 0.023–0.055); SE: 0.008; t-statistic: 4.85; $P < 0.001$.

Constant term 9.014 (9.865–9.062), standard error 0.025, $t = 366.68$, $p < 0.001$.

Note: A Generalized Linear Model (GLM) was employed for the analysis. The experimental group consisted of Yangxi County (assigned a value of 1), while the control group consisted of Yangchun City (assigned a value of 0). The intervention variable represents the implementation of the Medical Community construction (commencing in November 2017).

Impact of Medical Consortium on Average Hospitalization Cost of Diabetes Patients

The medical consortium (Medical Community) demonstrates significant potential in integrating tertiary medical resources, promoting cooperation between medical institutions, and optimizing service workflows and patient flow. Through the reform of health insurance payment methods—specifically the "total budget management, retention of surpluses, and sharing of overruns" model—health insurance funds and public health expenditures within the county are bundled and allocated to the medical consortium. This mechanism essentially provides the consortium with economic incentives for internal cost control and resource allocation.

However, the long-term effectiveness of the medical consortium in diverting diabetic inpatients shows a decaying trend ($\beta = -2.337, p = 0.092$). This suggests that the initial dividends of administrative integration may not be sustainable, highlighting the need to consolidate reform outcomes by strengthening primary healthcare service capabilities. In contrast, the number of hospitalizations in the control group showed an upward trend, reflecting a centralization of medical services in non-consortium areas. This indicates that the medical consortium plays a positive role in restructuring the regional medical service system.

The study further reveals that the medical consortium faces dual challenges in controlling hospitalization costs for diabetes. On one hand, there were significant differences in diabetic hospitalization costs between the two regions prior to policy implementation; the baseline hospitalization cost in Yangxi County was significantly higher than that in Yangchun City ($\beta = 0.252, p = 0.010$), which may stem from inherent differences in service costs at the county-level hospitals. On the other hand, following the implementation of the medical consortium, the

hospitalization costs in the experimental group exhibited a long-term upward trend ($\beta = 0.039, p = 0.001$), which was significantly higher than that of the control group.

This phenomenon may be attributed to several factors. First, the implementation of the Medical Community (MC) has reduced hospitalizations for patients with mild symptoms. As the total volume of inpatient admissions decreases, the proportion of severe or complex cases among those remaining hospitalized may relatively increase, thereby driving up the average cost per visit; however, this does not necessarily increase the total inpatient expenditure for diabetes within the county. Second, if the internal health insurance payment mechanisms of the MC lack refined design—such as failing to establish differentiated payment standards based on disease severity—hospitals may compensate for revenue shortfalls by increasing service intensity when facing financial pressure.

During the early stages of MC development, under the "global budget" framework, hospitals often lacked a strong incentive for cost control due to concerns that the insurance department would not return surplus funds. Furthermore, the evaluation methods for retaining surpluses were relatively simplistic and failed to account for the reasonable profit margins of different levels of medical institutions. This lack of a sophisticated incentive mechanism, combined with capitation-based insurance payments, hindered effective cost management. The results of this study further confirm this perspective within the field of diabetes. Additionally, the inherent complexity of diabetes management and treatment —characterized by numerous complications, frequent monitoring requirements, and the need for multidisciplinary collaboration—may also drive up diagnostic and therapeutic costs to some extent, rendering the cost-control effects of global budget reforms less apparent during their initial implementation.

Therefore, the rise in hospitalization costs should be comprehensively evaluated through multiple dimensions, including changes in patient demographics, adjustments to service content, and the design of payment mechanisms.

Research indicates that prior to the implementation of the policy, there were significant differences in diabetes readmission rates between the experimental and control groups, which may reflect regional disparities in medical resource allocation or disease management levels. Following the implementation of the medical community (county-managed health community) model, there was no significant improvement in diabetes readmission rates ($P = 0.271$, with a coefficient of -3.978) and no observable change in the length of stay ($P = 0.256$). Although this study did not perform a stratified analysis of service data between county-level and primary healthcare institutions, the results suggest that the service capacity of primary care has not yet been effectively enhanced.

Compared to hypertension, diabetes management places higher demands on primary healthcare for several reasons. First, the technical requirements are higher; adjusting insulin dosages and identifying or treating complications require professional technical support. Second, follow-up management is complex; blood

glucose monitoring, lifestyle interventions, medication guidance, and complication screening demand high levels of standardization and continuity in follow-up care. Third, there is a high requirement for information technology support. In the early stages of medical community construction, information systems at the county and township levels were not interconnected, and the lack of an effective chronic disease information management platform made patients prone to being lost to follow-up or having poor self-management compliance. This leads to fluctuations in condition and increases the risk of readmission. These capacity shortcomings make it difficult for primary healthcare institutions to effectively manage patients referred downward from higher-level hospitals, resulting in no significant improvement in diabetes management outcomes or readmission risks.

Furthermore, the chronic disease management centers have not yet been established, and the level of collaboration among county, township, and village medical institutions remains low, which may also affect the effectiveness of chronic disease management. Consequently, relying solely on administrative integration is insufficient to improve service quality. It is necessary to strengthen technical empowerment and the downward movement of talent. For chronic diseases that require intensive follow-up management, information technology empowerment is particularly needed to optimize business processes.

Based on these findings, to enhance the effectiveness of hierarchical diagnosis and treatment and chronic disease prevention during the construction of medical communities, it is recommended to focus on building a collaborative mechanism of "payment reform, capacity decentralization, and digital empowerment." First, precise reform of medical insurance payments should be pursued. This includes implementing "dual bundling" policies—bundling medical insurance fund payments alongside Diagnosis-Related Groups (DRG) payments—specifically for patients without complications.

First, implement a fixed-quota payment system for primary care first-contact services, while allowing for "special case negotiations"for patients with moderate-to-severe complications. This approach utilizes health insurance as an economic lever to guide the rational allocation of resources. Second, strengthen the long-term mechanism for county-level specialists to provide clinical support at the grassroots level. This involves enhancing the performance evaluation and incentives for endocrinologists from lead county hospitals who are stationed at township health centers. Key areas of technical assistance should include the use of insulin pumps, graded management of diabetes, and the treatment of complications, thereby addressing the dilemma where primary care facilities are unable to manage patients referred downward from higher-level hospitals. Third, enhance intelligent management through digital platforms. By integrating public health systems with the information platforms of the Medical Community, and utilizing AI-assisted decision-making systems, it is possible to achieve automatic updates of electronic health records, early warning of complication risks, and intelligent prompts for referral indications. These measures will improve the precision and continuity of chronic disease management at the primary level.

This study has several potential limitations. First, there is a time lag in the implementation of health policies; the observation period for the experimental group in Yangxi County was only two and a half years after the implementation of the Medical Community reform, meaning long-term effects may not yet be fully apparent. Second, there were baseline differences between Yangxi County and Yangchun City. Although the Interrupted Time Series (ITS) method was used to control for temporal trends, it was not possible to account for all potential confounding factors. Furthermore, the data were derived from the front pages of inpatient medical records and did not include indicators such as outpatient management or comprehensive patient health outcomes. This may limit the ability to conduct a holistic evaluation of the overall effectiveness of the Medical Community reform.

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