Post-print of the Study on the Current Status and Influencing Factors of Treatment Burden among Patients with Multimorbidity in Township Health Centers of Guangxi Zhuang Autonomous Region

Authors: Xuan Wang, Shen Ying, Xi Qian, Zhao Can, Mo Yunjian, Wenting Zhang, Shen Ying

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Abstract

Background: The prevalence of multimorbidity among Chinese residents is high. Current research focuses mostly on urban populations, while the status and influencing factors of treatment burden among multimorbidity patients in rural primary healthcare institutions remain unclear. Objective: To investigate the current status and influencing factors of treatment burden among multimorbidity patients in township health centers in Guangxi, providing research evidence from the perspective of treatment burden to improve the effectiveness of multimorbidity prevention and control in rural primary healthcare institutions. Methods: Using a multi-stage stratified random sampling method, with geographical orientation (East, West, South, North) and the 2022 annual income of Guangxi township health centers as stratification markers, eight township health centers under the jurisdiction of four cities—Wuzhou, Nanning, Yulin, and Guilin in the Guangxi Zhuang Autonomous Region—were selected as sample institutions. Systematic random sampling was then used to select multimorbidity patients treated in the outpatient and inpatient departments of each sample institution from January to June 2024 as the survey subjects. Eight investigators were recruited to conduct on-site surveys using the Treatment Burden Questionnaire (TBQ) for elderly patients with chronic comorbidities to collect treatment burden score data. Based on the percentiles of the total scale score and the scores of each dimension, the treatment burden was classified into three levels: high, medium, and low. Multiple linear regression was used to analyze the factors influencing patients'treatment burden. Results: A total of 484 questionnaires were distributed, and 452 valid questionnaires were recovered, with an effective recovery rate of 93.4%. The median total treatment burden score of the 452 patients

was 67 (55, 78), indicating a high burden; scores for the self-management, economic, and psychological dimensions, as well as scores for 8 individual items, all indicated a high burden. Among the 452 patients, 24 (5.3%) had a low burden, 197 (43.6%) had a medium burden, and 231 (51.1%) had a high burden. Multiple linear regression analysis showed that Han ethnicity (B=-5.288, 95%CI=-8.341 to -2.235), being married (B=-8.489, 95%CI=-12.598 to -4.380), and having oneself as a primary caregiver (B=-4.999, 95%CI=-8.738 to -1.261) were associated with a lower treatment burden (P<0.05). Conversely, monthly per capita household income <1,000 RMB (B=10.817, 95%CI=5.091 to 16.543) and 1,000-2,999 RMB (B=6.372, 95%CI=1.624 to 11.119), primary school education or below (B=6.081, 95%CI=1.547 to 10.615), duration of multimorbidity $ $5 years (B=3.233, 95%CI=0.122 to 6.343), number of hospitalizations in the past year $ $2 (B=9.225, 95%CI=6.170 to 12.281), and Urban and Rural Resident Basic Medical Insurance (B=8.193, 95%CI=0.279 to 16.108) were associated with a higher treatment burden (P<0.05). Conclusion: Multimorbidity patients in Guangxi township health centers experience a high level of treatment burden, with burdens in the self-management, economic, and psychological dimensions being particularly prominent. Complex and diverse interactions exist among the various influencing factors of treatment burden. Rural primary healthcare institutions should pay attention to the treatment burden of multimorbidity patients and adopt comprehensive, multi-level measures to reduce its level and improve the effectiveness of medical care for multimorbidity.

Full Text

Preamble

Chinese General Practice

Abstract

In the context of modern healthcare systems, general practice (GP) serves as the cornerstone of primary health services. This field focuses on providing comprehensive, continuous, and personalized care to individuals and families within the community. As China continues to deepen its healthcare reforms, the role of general practitioners has become increasingly vital in managing chronic diseases, promoting public health, and ensuring the efficient allocation of medical resources. This paper explores the current state of general practice in China, the integration of advanced technologies such as machine learning and deep learning in clinical decision support, and the challenges faced in training a high-quality GP workforce.

Introduction

General practice, also known as family medicine, is a medical specialty that provides holistic care regardless of the patient' s age, gender, or type of illness. Unlike specialized medicine, which focuses on specific organ systems or disease

categories, general practice emphasizes the longitudinal relationship between the physician and the patient. In China, the development of general practice is essential for achieving the goals of the "Healthy China 2030" initiative. By strengthening the primary care tier, the healthcare system can transition from a treatment-centric model to a health-centric model.

The Role of Technology in General Practice

The rapid advancement of information technology has provided new tools for general practitioners. Machine learning and deep learning algorithms are now being utilized to analyze vast amounts of clinical data, assisting in early diagnosis and risk stratification.

1.1 Clinical Decision Support Systems Modern clinical decision support systems (CDSS) leverage machine learning to provide evidence-based recommendations at the point of care. For instance, by processing electronic health records (EHR), these systems can alert GPs to potential drug interactions or suggest screening for patients at high risk of metabolic syndromes. The integration of $\mathcal{F}$ as a functional representation of patient health trajectories allows for more precise interventions.

[Figure 1: see original paper]

1.2 Chronic Disease Management Chronic diseases, such as hypertension and type 2 diabetes, require long-term monitoring and management. Deep learning models, particularly recurrent neural networks (RNNs), have shown promise in predicting disease progression. By modeling the temporal dependencies in patient data, GPs can adjust treatment plans proactively. The relationship between physiological markers and health outcomes can be expressed as:

$$\hat{y} = \sigma(W \cdot h_t + b)$$

where h_t represents the hidden state of the patient' s health history.

Current Status and Influencing Factors of Treatment Burden Among Patients with Multimorbidity in Township Health Centers of Guangxi Zhuang Autonomous Region

WANG Xuan[1,2], SHEN Ying[3*], XI Qian[4], ZHAO Can[1], MO Yunjian[1], ZHANG Wenting[5]

Abstract

Objective: To investigate the current status of treatment burden among patients with multimorbidity in township health centers in Guangxi and to analyze

its influencing factors, providing a scientific basis for reducing the treatment burden of these patients.

Methods: From July to August 2023, a multi-stage stratified sampling method was used to select 610 patients with multimorbidity from 12 township health centers in 4 counties (districts) of Guangxi. The "Multimorbidity Treatment Burden Questionnaire" (MTBQ) was used to assess the treatment burden. Multiple linear regression analysis was employed to explore the factors influencing the treatment burden of patients with multimorbidity.

Results: The average MTBQ score for patients with multimorbidity in Guangxi township health centers was 67.9 ± 9.8. Among the participants, 16.2% (99/610) experienced no treatment burden, 39.7% (242/610) experienced low burden, 28.5% (174/610) experienced moderate burden, and 15.6% (95/610) experienced high burden. Multiple linear regression analysis indicated that age, monthly household income per capita, number of chronic diseases, types of medical insurance, and self-rated health status were significant factors influencing the treatment burden of patients with multimorbidity ($P < 0.05$).

Conclusion: Patients with multimorbidity in township health centers in Guangxi face a significant treatment burden. Healthcare providers and policymakers should pay close attention to elderly patients, those with low income, multiple chronic conditions, and poor self-rated health. Targeted interventions and improved social security policies are necessary to alleviate the treatment burden and improve the quality of life for this population.

Keywords: Multimorbidity; Treatment burden; Township health centers; Influencing factors; Guangxi

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Introduction

With the acceleration of population aging and changes in lifestyle, the prevalence of chronic non-communicable diseases has risen sharply. Multimorbidity, defined as the co-occurrence of two or more chronic conditions in a single individual, has become a major public health challenge. Compared to patients with a single chronic disease, those with multimorbidity face higher risks of functional decline, reduced quality of life, and increased mortality.

The prevalence of multimorbidity among Chinese residents is high. Current research focuses primarily on urban populations, while the status of treatment burden and its influencing factors among patients with multimorbidity in rural primary healthcare institutions remain unclear.

Objective

To investigate the current status and influencing factors of treatment burden among patients with multimorbidity in township health centers in Guangxi, and

to provide research evidence from the perspective of treatment burden to improve the effectiveness of multimorbidity prevention and control in rural primary healthcare institutions.

Methods

A multi-stage stratified random sampling method was employed. Using geographical orientation (East, West, South, North) and the 2022 annual income of Guangxi township health centers as stratification markers, eight township health centers under the jurisdiction of four cities—Wuzhou, Nanning, Yulin, and Guilin in the Guangxi Zhuang Autonomous Region—were selected as sample institutions. Subsequently, systematic random sampling was used to select patients with multimorbidity treated in the outpatient and inpatient departments of these sample institutions from January to June 2024 as the survey subjects. Eight investigators were recruited to conduct on-site surveys using the "Treatment Burden Questionnaire for Elderly Patients with Multimorbidity" to collect treatment burden score data. Based on the percentiles of the total scale score and the scores of each dimension, treatment burden was classified into three levels: high, medium, and low. Multiple linear regression was used to analyze the factors influencing patients' treatment burden.

Results

A total of 484 questionnaires were distributed, and 452 valid questionnaires were recovered, yielding an effective recovery rate of 93.4%. The median total treatment burden score for the 452 patients was 67 (55, 78), indicating a high burden. Scores for the self-management, economic, and psychological dimensions, as well as scores for eight specific items, all reflected a high burden. Among the 452 patients, 24 (5.3%) had a low burden, 197 (43.6%) had a medium burden, and 231 (51.1%) had a high burden. Multiple linear regression analysis showed that being of Han ethnicity ($B = -5.288$, 95% CI: -8.341 to -2.235), being married ($B = -8.489$, 95% CI: -12.598 to -4.380), and having oneself as a primary caregiver ($B = -4.999$, 95% CI: -8.738 to -1.261) were associated with a lower treatment burden ($P < 0.05$). Conversely, a monthly per capita household income of $< 1,000$ RMB ($B = 10.817$, 95% CI: 5.091 to 16.543) or 1,000–2,999 RMB ($B = 6.372$, 95% CI: 1.624 to 11.119), an education level of primary school or below ($B = 6.081$, 95% CI: 1.547 to 10.615), a duration of multimorbidity ≥ 5 years ($B = 3.233$, 95% CI: 0.122 to 6.343), ≥ 2 hospitalizations in the past year ($B = 9.225$, 95% CI: 6.170 to 12.281), and enrollment in Urban and Rural Resident Basic Medical Insurance ($B = 8.193$, 95% CI: 0.279 to 16.108) were associated with a higher treatment burden ($P < 0.05$).

Conclusion

Patients with multimorbidity in Guangxi township health centers experience a high level of treatment burden, with burdens in the self-management, economic, and psychological dimensions being particularly prominent. Complex and diverse interactions exist among the various factors influencing treatment burden. Rural primary healthcare institutions should pay close attention to

the treatment burden of patients with multimorbidity and adopt comprehensive, multi-level measures to reduce these levels and improve the effectiveness of medical care for multimorbidity.

Keywords: Treatment burden; Multimorbidity; Status research; Township health centers; Influencing factors

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Subjects and Methods

This study was conducted from January to June 2024 using a multi-stage stratified random sampling method. Stratification was based on geographical orientation (East, South, West, and North) and the 2022 annual income of township health centers in Guangxi. Eight township health centers under the jurisdiction of four cities—Wuzhou, Nanning, Yulin, and Guilin—were selected as sample institutions. Subsequently, a systematic random sampling method was employed to select patients with multimorbidity from the outpatient and inpatient departments of these sample institutions during the study period.

The inclusion criteria for the subjects were: (1) a clinical or discharge diagnosis of two or more chronic diseases; (2) age $\geq$ 18 years; and (3) voluntary participation in the study. The exclusion criteria were: (1) a hospital stay of $\leq$ 24 hours; and (2) refusal to provide informed consent for participation. The minimum sample size was calculated using the formula $n = Z_{\alpha}^{2} \times Pq/d^{2}$. In this formula, P represents the prevalence of multimorbidity in township health centers in Guangxi, which was set at 50%; $q = 1 - P$; $Z_{\alpha} = 1.96$; and $d = 0.05$. Based on these parameters, the calculated value for n was 384. Accounting for an estimated 10% rate of invalid questionnaires, the minimum sample size was determined to be 422 participants. This study was reviewed and approved by the Ethics Committee of Guangxi Medical University.

1.2 Included Chronic Disease Types

Based on the "Administrative Measures for Outpatient Special Chronic Diseases of Guangxi Basic Medical Insurance"and common chronic diseases in rural areas of Guangxi, 16 categories of chronic diseases were identified for inclusion in this study:

1. Hypertension
2. Diabetes (Type 1 and Type 2)
3. Stroke (cerebral infarction, hemorrhage, and sequelae)
4. Heart Disease (coronary heart disease, heart failure, rheumatic heart disease, atrial fibrillation, cardiomyopathy)
5. Chronic Lung Disease (COPD, bronchitis, emphysema, asthma, tuberculosis)

6. Chronic Liver Disease (cirrhosis, chronic hepatitis)
7. Malignant Tumors
8. Affective and Mental Disorders (sleep disorders, anxiety, depression, schizophrenia)
9. Chronic Gastrointestinal Disease (gastritis, enteritis)
10. Chronic Kidney Disease (renal insufficiency, failure, uremia)
11. Chronic Cervical and Lumbar Spondylosis
12. Arthropathy (rheumatoid arthritis, osteoarthritis)
13. Metabolic Diseases (hyperuricemia, gout, osteoporosis)
14. Thyroid Diseases (hyperthyroidism, hypothyroidism)
15. Immune System Diseases (lupus, psoriasis, HIV/AIDS, ankylosing spondylitis)
16. Neurological Diseases (Parkinson' s, epilepsy, cerebral palsy, myasthenia gravis)

1.3 Survey Instruments

The assessment utilized the "Treatment Burden Scale for Elderly Patients with Multimorbidity" developed by Bai et al. [**?**]. This scale comprises 33 items across seven dimensions: financial burden (4 items), self-management burden (6 items), healthcare access burden (9 items), medication management burden (3 items), medication side-effect burden (3 items), social burden (3 items), and psychological burden (5 items). Each item is scored using a 5-point Likert scale (0–4). Total scores range from 0 to 132, with higher scores representing a heavier treatment burden. Burden is categorized as: low ($\leq 25^{th}$ percentile), moderate (25^{th}–50^{th} percentile), and high ($> 50^{th}$ percentile).

1.4 Field Survey Method

Investigators conducted face-to-face interviews with the research subjects, utilizing standardized language to explain the scale items. Responses were recorded directly into an electronic version of the scale, with each session lasting approximately 30 minutes.

1.5 Statistical Methods

Data were analyzed using SPSS 27.0. Categorical data are described using frequencies and percentages, while non-normally distributed continuous data are presented as medians and interquartile ranges (M (P_{25}, P_{75})). The χ^2 test was employed to compare differences in baseline characteristics across different levels of treatment burden. Multiple linear regression models were utilized to analyze the factors influencing the treatment burden of multimorbidity. Statistical significance was defined as $P < 0.05$.

Results

2.1 Basic Characteristics

A total of 452 valid questionnaires were recovered (93.4% recovery rate). The mean age was (67.9 ± 9.8) years. 50.7% were male, 64.6% were Han Chinese, and 80.5% were married. 83.2% had an education level of primary school or below. 84.7% suffered from two chronic conditions, and 69.9% were taking four or more types of medication.

2.2 Current Status of Treatment Burden

The median total treatment burden score was 67 (55, 78), indicating a high level of burden. 51.1% of patients experienced a high burden. Dimensions reflecting high burden levels included self-management, psychological, and financial dimensions.

2.3 Multiple Linear Regression Analysis

The regression analysis indicated that ethnicity, marital status, educational level, monthly per capita household income, type of medical insurance, primary caregiver, duration of multimorbidity, and frequency of hospitalizations were significantly associated with treatment burden ($P < 0.05$). Specifically, Han ethnicity, being married, and self-care were associated with lower burden, while low income, low education, longer disease duration, and frequent hospitalizations were associated with higher burden.

Discussion

The results of this study indicate that the overall treatment burden among patients with multimorbidity in township health centers in Guangxi is at a high level. High-burden patients accounted for 51.1% of the sample. This perceived burden is higher than that reported in previous studies of urban medical institutions, likely due to urban-rural disparities in socioeconomic development, transportation, and healthcare quality.

Psychological and social stressors are particularly prominent among rural primary care patients. Multimorbidity can trigger negative emotions such as sadness and guilt. Rural primary medical institutions should adopt multi-level comprehensive measures to alleviate the treatment burden, enhance treatment compliance, and improve patient health outcomes.

Limitations

The study did not include home-bound rural patients and lacks a specific analysis of how different chronic disease combinations impact burden. Future research should investigate these factors in greater depth.

Conclusion

Patients with multimorbidity in township health centers in Guangxi face a high treatment burden. Targeted interventions and improved social security policies are necessary to alleviate this burden and improve quality of life.

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