Postprint of a Survey on the Current Status and Influencing Factors of Therapeutic Inertia Among Primary Care Physicians in Hypertension Diagnosis and Treatment

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Abstract

Background: Hypertension is a common chronic disease that poses serious threats to population health. Primary care physicians constitute the main force in hypertension management, while iatrogenic therapeutic inertia substantially influences the achievement of blood pressure control targets in primary care settings. Objective: To investigate the current status of therapeutic inertia among primary care physicians in hypertension diagnosis and treatment, analyze its underlying causes, and provide a reference basis for improving hypertension control rates in China. Methods: Using simple random sampling, a questionnaire survey was conducted among primary care physicians from 32 primary healthcare institutions in Tianjin between July and August 2023. The current status of therapeutic inertia in hypertension diagnosis and treatment was evaluated across three dimensions: mastery of hypertension diagnosis and treatment knowledge, "soft reasons," "overestimation of treatment efficacy," and "medical insurance policies." Binary Logistic regression analysis was employed to explore influencing factors of therapeutic inertia. Results: A total of 407 questionnaires were distributed, with 386 valid questionnaires returned, yielding an effective response rate of 97.96%. (1) The hypertension diagnosis and treatment knowledge score of primary care physicians was 6 (0.5), with a scoring rate of 61.19% (5.50/9.00); the total therapeutic inertia score for hypertension was 48 (7.0) points, with a scoring rate of 56.55% (45.24/80.00). (2) The "soft reasons" dimension score was 26 (4.8), with a scoring rate of 51.97% (25.89/50.00); the "overestimation of treatment efficacy" dimension score was 10 (2.0), with a scoring rate of 65.42% (9.81/15.00); the "medical insurance policy" dimension score was 6 (2.5), with a scoring rate of 44.64% (6.96/15.00). Comparison of average therapeutic inertia scores among the three dimensions

revealed that the "medical insurance policy" dimension had the lowest score compared to the other two groups (P<0.05). Multifactorial analysis demonstrated that male gender, rural-related areas, lower mastery of hypertension diagnosis and treatment knowledge, and seeing $ $10 hypertension patients per week were associated with higher tendencies toward therapeutic inertia (P<0.05). Conclusion: Therapeutic inertia is prevalent among primary care physicians during hypertension diagnosis and treatment. Lower cognitive levels regarding hypertension diagnosis and treatment, "overestimation of treatment efficacy," and "soft reasons" constitute the main factors contributing to therapeutic inertia. It is recommended to strengthen education specifically targeting therapeutic inertia in hypertension, conduct diversified training programs on diagnosis and treatment knowledge and management, and simultaneously promote clinical informatization and artificial intelligence decision-making systems, which may effectively ameliorate therapeutic inertia in hypertension management among primary care physicians.

Full Text

Investigation of Therapeutic Inertia and Influencing Factors in Primary Care Physicians During Hypertension Diagnosis and Treatment Process

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Abstract

Background Hypertension is a common chronic disease that seriously endangers the health of the population. Primary-care doctors are the main force in the management of hypertension. However, doctor-induced therapeutic inertia greatly affects the achievement of primary-care hypertension control. **Objective** The aim of this study is to investigate the current status of therapeutic inertia among primary healthcare providers in the diagnosis and treatment process of hypertension, and analyze the causes of therapeutic inertia, providing a reference basis for improving hypertension control rates in China. **Methods** A simple random sampling method was used to distribute questionnaires to primary healthcare providers in 32 primary healthcare institutions in Tianjin from July to August 2023. The therapeutic inertia in the diagnosis and treatment process of hypertension was evaluated from three dimensions: knowledge mas-

tery of hypertension diagnosis and treatment, "soft reasons" and "overestimation of treatment efficacy" as well as "medical insurance policies." Binary logistic regression analysis was employed to explore the influencing factors of therapeutic inertia. **Results** A total of 407 questionnaires were distributed in this study, and 386 valid questionnaires were collected, yielding an effective response rate of 97.96%. The average score for primary healthcare providers' knowledge of hypertension diagnosis and treatment was 6 (0.5), with a scoring rate of 61.19% (5.50/9.00). The total score for therapeutic inertia in hypertension management was 48 (7.0), with a scoring rate of 56.55% (45.24/80.00). The scores for the "soft reasons" dimension, "overestimation of treatment efficacy" dimension, and "medical insurance policies" dimension were 26 (4.8), 10 (2.0), and 6 (2.5) respectively, with scoring rates of 51.97% (25.89/50.00), 65.42% (9.81/15.00), and 44.64% (6.96/15.00) respectively. When comparing the average scores of the three dimensions of therapeutic inertia, the "medical insurance policies" dimension had the lowest score compared to the other two groups ($P<0.05$). Multivariate analysis showed that male gender, rural areas, lower mastery of hypertension diagnosis and treatment knowledge, and a weekly patient volume of less than 10 hypertensive individuals were associated with a higher tendency towards therapeutic inertia among primary healthcare providers ($P<0.05$). **Conclusion** Therapeutic inertia is prevalent among primary healthcare providers in the diagnosis and treatment process of hypertension. Low levels of hypertension treatment cognition, overestimation of treatment efficacy, and "soft reasons" are the primary factors contributing to therapeutic inertia among primary healthcare providers. It is recommended to strengthen education on therapeutic inertia in hypertension, conduct diversified training on diagnostic and management knowledge, and promote clinical informatization and artificial intelligence decision-making systems to effectively improve the therapeutic inertia of primary healthcare providers in hypertension management.

Keywords Hypertension; Community management; Primary care doctors; Physician cognition; Therapeutic inertia; Tianjin City

Background

Hypertension is a common chronic disease that seriously endangers public health, with surveys indicating that approximately 245 million people in China suffer from hypertension [1]. Long-term uncontrolled hypertension is a major cause of increased cardiovascular disease risk and mortality. However, studies show that the blood pressure control rate among hypertensive patients in China is only 11.2% [2]. Therapeutic inertia in hypertension refers to the failure of physicians to intensify treatment or modify therapeutic regimens when patients' blood pressure remains uncontrolled. Therapeutic inertia is a critical factor contributing to poor blood pressure control, with research indicating that up to 80% of hypertensive patients experience therapeutic inertia during clinical visits [3]. According to Mancia et al. [4], reducing the incidence of therapeutic

inertia can significantly improve prognosis for hypertensive patients, as even a 5 mmHg reduction in blood pressure can decrease the risk of major cardiovascular events by 10%. Therapeutic inertia is influenced by multiple factors including patient, physician, and social determinants, with physician-related factors being the primary contributors. As the main force in hypertension prevention and treatment, the quality of hypertension management by primary care physicians directly affects future trends in cardiovascular and cerebrovascular diseases [5]. Based on this background, this study aims to investigate the current status and causes of therapeutic inertia among primary care physicians during the diagnosis and treatment of hypertension, to provide an effective reference for future interventions.

Methods

Survey Subjects

This study utilized the "raosoft calculator"tool to estimate the minimum required sample size based on a 50% response distribution, 5% acceptable error margin, and 95% confidence interval, which indicated that at least 377 primary care physicians needed to be surveyed [6]. From July to August 2023, the research team employed simple random sampling to select two community health service centers or township health clinics from each district in Tianjin. All physicians in the selected facilities who met the inclusion and exclusion criteria were enrolled in the survey.

Inclusion and Exclusion Criteria

Inclusion criteria: (1) Frontline clinical doctors currently working in community hospitals; (2) Engaged in primary healthcare work for more than 1 year; (3) Possessing a practicing physician qualification certificate; (4) Voluntary participation with signed informed consent. **Exclusion criteria:** Having been away from frontline clinical work for more than 1 year. A total of 407 questionnaires were distributed, 396 were returned, and 386 valid questionnaires were obtained. This study was approved by the Ethics Committee of Tianjin Medical University General Hospital (Approval No.: IRB-2023-KY-250).

Survey Content

1.3.1 Background Information of Primary Care Physicians The survey included age, gender, professional title, years of practice, education level, department, weekly number of hypertensive patients seen, and region.

1.3.2 Mastery of Hypertension Diagnosis and Treatment Knowledge Based on the "2020 Guidelines for Hypertension Prevention and Management in Primary Care,"the research team designed nine questions regarding hypertension diagnosis and treatment knowledge. Content included diagnostic thresholds, blood pressure targets for uncomplicated hypertension and hypertension with

various comorbidities, whether to intensify treatment for patients with blood pressure $ $145/95 mmHg after medication, and whether to choose monotherapy or combination therapy for patients with initial stable blood pressure of 155/105 mmHg. This section totaled 9 points, with 1 point for each correct answer and 0 for incorrect answers. After discussion among three clinical and health statistics experts, participants with final scores >6 were defined as having high mastery of hypertension diagnosis and treatment knowledge.

1.3.3 Assessment of Therapeutic Inertia in Primary Care Physicians
Based on the consensus study by Jean et al. [7] and review of domestic and international literature [8-17], the research team conducted in-depth discussions with experts in hypertension and general practice to design the initial draft of the survey questionnaire on therapeutic inertia among primary care physicians. The draft was pre-tested on 30 general practitioners at Huayuan Community Health Service Center in Nankai District and Dazhangzhuang Community Health Service Center in Beichen District of Tianjin. Based on feedback from participants, questionnaire items were revised to better reflect the current status of primary care hypertension management, resulting in the final questionnaire. The questionnaire presented specific clinical scenarios for patients with particular conditions. The scenario described was: "A hypertensive patient has been on medication for 3 months, but blood pressure remains at 145/95 mmHg, and meets the following conditions: (1) Elevated blood pressure has been confirmed by self-measurement or ambulatory blood pressure monitoring, and the measurements are accurate and reliable; (2) The patient takes medication as prescribed without adverse drug reactions; (3) The patient has no medical problems more important or urgent than hypertension; (4) The patient has no financial difficulties in receiving hypertension treatment."

Based on this scenario, the assessment of therapeutic inertia included three dimensions with a total of 16 items to inquire about physicians' attitudes when facing different clinical situations. A Likert 5-point scale was used, with each item scored from 1 to 5 according to "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." The three dimensions of "soft reasons," "overestimation of treatment efficacy," and "medical insurance policies" had respective scores of 50, 15, and 15 points, with a total score of 80 points across all three dimensions. Higher scores indicated a greater likelihood of inertia behaviors in hypertension management among primary care physicians. In this study, participants with a total inertia score $ $48 were defined as having high inertia tendency. Scoring rate = (average scale score / total scale score) × 100%.

Survey Methods and Quality Control

Before the survey, the research team conducted online training for five survey personnel to explain the purpose and precautions of the investigation. After communicating with the directors of community health service centers and township health clinics, the directors and survey personnel explained the purpose of the

questionnaire to primary care physicians and defined the concepts involved. A WeChat working group was established, and the "Questionnaire Star" software was used to distribute the survey to participants. Instructions for completing the questionnaire were provided, specific items were explained, and questions were answered. Each mobile phone was limited to one response, with a 10-minute time limit. After questionnaire collection, two staff members conducted cross-review to exclude questionnaires with missing answers, consecutive regular responses, or identical answers, resulting in 386 valid questionnaires. The Cronbach' s α coefficients for all three dimensions were greater than 0.7. Confirmatory factor analysis showed that the composite reliability values for all three factors were >0.7, and the square root of the average variance extracted for each factor was greater than its Pearson correlation coefficient with other factors, indicating reliable validity of the questionnaire.

Statistical Methods

SPSS 23.0 and AMOS 26.0 software were used for statistical analysis and reliability and validity testing. Count data were described using frequency and percentage. Normally distributed measurement data were expressed as ($\bar{x}\pm s$), and non-normally distributed measurement data were expressed as [M(QR)]. The Wilcoxon test was used for comparisons between two groups, and the Kruskal-Wallis test was used for comparisons among multiple groups. Variables with significant differences in univariate analysis were included in binary logistic stepwise regression analysis to explore influencing factors of therapeutic inertia. $P<0.05$ was considered statistically significant.

Results

Basic Characteristics of Study Participants

Among the 386 primary care physicians, 243 (62.95%) were female. Age distribution showed 148 (38.34%) were aged $ $40 years. For years of practice, 88 (22.79%) had practiced for <10 years, 131 (33.93%) for 10-20 years, and 167 (43.26%) for >20 years. Educational attainment was high, with 273 (70.72%) having bachelor' s degree or higher education. Weekly patient volume varied: 108 (27.97%) saw $ $10 hypertensive patients weekly, 151 (39.11%) saw 10-50 patients, 73 (18.91%) saw 50-100 patients, and 54 (13.98%) saw >100 patients. A majority worked in rural areas (197, 51.03%). Only 94 (24.35%) had high mastery of hypertension diagnosis and treatment knowledge.

Therapeutic Inertia and Knowledge Scores

The total therapeutic inertia score for hypertensive treatment was 48 (7.0) points, with a scoring rate of 56.55%. The knowledge score for hypertension diagnosis and treatment was 6 (0.5), with a scoring rate of 61.19%. The "overestimation of treatment efficacy" dimension score was 10 (2.0) with a scoring rate of 65.42%; the "soft reasons" dimension score was 26 (4.8) with a scoring

rate of 51.97%; and the "medical insurance policies" dimension score was 6 (2.5) with a scoring rate of 44.64%. Specific scores for each item are shown in Table 1 .

Comparison of Therapeutic Inertia Scores Among Physicians with Different Characteristics

Male physicians, those seeing $ $10 hypertensive patients weekly, those in rural areas, and those with lower hypertension diagnosis and treatment knowledge scores had significantly higher scores in the "overestimation of treatment efficacy" dimension (P<0.05). Physicians seeing $ $10 hypertensive patients weekly had significantly higher scores in the "soft reasons" dimension (P<0.05). Non-general practice physicians, those with education below bachelor' s degree, and those seeing $ $10 hypertensive patients weekly had significantly higher scores in the "medical insurance policies" dimension (P<0.05). See Table 2 .

Comparison of Average Scores Across Three Dimensions

The average score for each dimension was calculated as: total dimension score / number of items in the dimension. In the comparison of average scores across the three dimensions, the "overestimation of treatment efficacy" dimension had a significantly higher average score than the other two dimensions (P<0.05). See Figure 1 [Figure 1: see original paper].

Multifactor Analysis of Therapeutic Inertia in Primary Care Physicians

Using the therapeutic inertia score as the dependent variable (assignment: high inertia tendency = 1, low inertia tendency = 0) and background information and hypertension diagnosis and treatment knowledge score as independent variables, logistic regression analysis showed that male gender (OR=1.68, 95%CI=1.06-2.07), rural areas, lower mastery of hypertension diagnosis and treatment knowledge, and a weekly hypertensive patient volume $ $10 were associated with higher therapeutic inertia tendency (P<0.05). See Table 3 .

Given that the "overestimation of treatment efficacy" dimension had a higher average score than the other two dimensions, this study further analyzed the influencing factors of therapeutic inertia in this dimension. Using the "overestimation of treatment efficacy" dimension score as the dependent variable (assignment: score <9 = 0, $ $9 = 1) and background information and hypertension diagnosis and treatment knowledge score as independent variables, multivariate logistic regression analysis showed that physicians seeing $ $10 hypertensive patients weekly, those with lower knowledge scores, and those in rural areas had higher therapeutic inertia tendency in the "overestimation of treatment efficacy" dimension (P<0.05). See Table 4 .

Discussion

High Prevalence of Therapeutic Inertia Among Primary Care Physicians in Hypertension Management

Therapeutic inertia remains highly prevalent in current clinical practice and is considered a major cause of poor blood pressure control. Some researchers attribute 50% of therapeutic inertia to physician-related factors [17]. A 2021 Dutch cohort study reported that approximately 87% of 6,400 patients with uncontrolled hypertension did not receive intensified antihypertensive treatment from their general practitioners [18]. Currently, there is a lack of survey research on the status of therapeutic inertia among primary care physicians in China. Data from the 2012-2015 China Hypertension Survey indicated that only 37.60% of patients receiving antihypertensive treatment had their blood pressure controlled [19], while a study by Li Dianjiang et al. [20] showed that the overall detection rate of clinical inertia among community patients with type 2 diabetes was 93.96%, suggesting that therapeutic inertia may be widespread among primary care physicians in China for hypertension and other chronic diseases. This study reports the current status of therapeutic inertia among primary care physicians in China, with results showing a therapeutic inertia score of 48 (7.0) points and a scoring rate of 56.55% in the hypertension diagnosis and treatment process, indicating a high level of therapeutic inertia among primary care physicians. Therefore, improving the current situation of therapeutic inertia among primary care physicians is an important approach to enhancing hypertension control rates in China.

Low Cognitive Level of Hypertension Diagnosis and Treatment and Its Close Relationship with Therapeutic Inertia

Studies have shown that insufficient awareness of evidence-based guidelines among primary care physicians is a key factor leading to therapeutic inertia [21], a finding supported by this study. The knowledge score rate for hypertension diagnosis and treatment among primary care physicians was only 61.19%, indicating inadequate mastery of hypertension diagnosis and treatment knowledge among most primary care physicians. Similar findings were validated in a study by Wang Nameng et al. [22]. Furthermore, this study found that physicians with higher mastery of diagnosis and treatment knowledge had significantly lower therapeutic inertia scores than their less knowledgeable counterparts. Multivariate analysis also demonstrated that physicians with lower cognitive levels had higher therapeutic inertia tendency. Other studies have reported similar results; a Spanish study found that physicians' knowledge of hypertension diagnosis and treatment was a major factor affecting therapeutic inertia (OR=49.80, 95%CI=42.30-58.60) [23]. The CRHCP study [24] showed that blood pressure control rates were significantly higher among patients treated by village doctors who received professional training compared to those treated by untrained village doctors. These findings reveal that targeted improvement of primary care physicians' hypertension management competence is an effective method

to reduce therapeutic inertia.

"Overestimation of Treatment Efficacy" and "Soft Reasons" as Primary Factors Contributing to Therapeutic Inertia

"Overestimation of treatment efficacy," "soft reasons," and "medical insurance policies" are all major causes of physician-related therapeutic inertia [25]. In the comparison of average scores across the three inertia dimensions, "overestimation of treatment efficacy" and "soft reasons" scores were significantly higher than the "medical insurance policies" score, suggesting these two factors are important causes of therapeutic inertia among primary care physicians in Tianjin. "Overestimation of treatment efficacy" was mainly reflected in the majority of primary care physicians agreeing that "patients can improve blood pressure through lifestyle modifications" [4 (1.0)]. A survey on causes of therapeutic inertia among general practitioners reported similar results, finding that 28% of general practitioners did not intensify drug therapy because they believed patients could improve blood pressure through lifestyle changes [26]. Therefore, future emphasis should be placed on the importance of pharmacological intensification when lifestyle modifications fail to improve blood pressure within the guideline-recommended time frame.

The "soft reasons" dimension showed high inertia scores for items such as "not intensifying treatment due to unfamiliarity with patient history" [4 (1.0)] and "not intensifying treatment because the patient presented with other complaints" [3 (1.0)]. Primary care physicians in China often encounter hypertensive patients with multiple comorbidities. When patients have multiple needs, physicians may lack the professional competence to make antihypertensive decisions and tend to maintain existing treatments [27-28]. Primary care physicians play a comprehensive role in the healthcare system. While emphasizing their responsibility in holistic patient care, clinical decision support systems should be vigorously introduced to effectively help physicians comprehensively understand patient information and make rational antihypertensive decisions.

Multifactor Analysis of Therapeutic Inertia in Primary Care Physicians

This study' s multivariate analysis showed that male gender, rural areas, lower mastery of hypertension diagnosis and treatment knowledge, and a weekly hypertensive patient volume $ $10 were associated with higher therapeutic inertia tendency. A study by Bralic et al. [29] similarly demonstrated that male gender and lower patient volume were associated with higher rates of therapeutic inertia among general practitioners. Gender differences may reflect individual cognitive and attitudinal variations among physicians, with a study by Liu Qing et al. [30] also showing that female primary care physicians had significantly higher diagnostic and treatment cognition than their male counterparts. Physicians with lower weekly patient volume may be more prone to therapeutic inertia, possibly due to insufficient practical experience. Higher therapeutic inertia tendency

among physicians in rural areas may be related to inadequate medical resources in these regions [28]. A study by Gil et al. [31] also observed that blood pressure control rates were lower among patients treated in primary healthcare clinics compared to those treated in high-end private clinics. The research team recommends that interventions targeting therapeutic inertia should focus on male physicians, those in rural areas, physicians with lower mastery of hypertension diagnosis and treatment knowledge, and those with fewer weekly hypertensive patients.

This study has several limitations. First, it only included primary care physicians from Tianjin as study subjects, which may not be representative of primary care physicians nationwide. Additionally, this survey of therapeutic inertia among primary care physicians was based on self-assessment rather than objective data measurement, and therapeutic inertia in actual clinical practice may be more severe.

In conclusion, this survey demonstrates that therapeutic inertia is prevalent among primary care physicians in the hypertension diagnosis and treatment process. Low cognitive levels of hypertension management, "overestimation of treatment efficacy," and "soft reasons" are the main causes. It is recommended to implement targeted education on therapeutic inertia in hypertension, provide diversified training on diagnosis and treatment knowledge, particularly for male physicians, those in rural areas, and those with lower patient volume. Establishing monitoring mechanisms for primary hypertension management, regularly evaluating primary care physicians' performance in hypertension treatment, and implementing clinical informatization and artificial intelligence-supported decision-making systems may help correct therapeutic inertia resulting from "soft reasons" and "overestimation of treatment efficacy."

Author Contributions: BIAN Bo and LIU Pei proposed the research objectives and were responsible for the conception and design of the study. WANG Xuezhu and WEI Tingting completed the questionnaire design and wrote the initial draft. LIU Ying and PAN Liping reviewed the rationality of the questionnaire and were responsible for quality control and review. BIAN Bo had overall responsibility for the article and supervised the study.

Conflict of Interest: The authors declare no conflict of interest.

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