Eight-Year Trajectories of Healthcare-Seeking Behavior and Influencing Factors Among Hypertensive Patients: A Postprint

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Date: 2025-05-08T14:34:16+00:00

Abstract

Background: Hypertension has gradually emerged as a major disease threatening public health and affecting quality of life. Characterized by a prolonged disease course, numerous complications, and being essentially incurable, hypertensive patients require long-term medical care. Understanding the long-term trends in medical seeking behavior and their influencing factors is crucial for developing precise prevention strategies and health services for hypertension. Objective: To model long-term medical seeking behavior trajectories of community-managed hypertensive patients using group-based trajectory modeling, characterize their features and behavior transition factors, and provide evidence for hypertension prevention and treatment policies. Methods: We selected 8,922 hypertensive patients with continuous records in community health records since 2014. Data on outpatient visits and follow-up management from 2014-2021 were collected through the personal electronic health record system. Group-based Trajectory Model (GBTM) was employed to analyze patterns of medical seeking behavior change, simulate transitions across different groups, and identify the optimal trajectory model. ANOVA and chi-square tests were used to compare patient characteristics across trajectory groups. Multivariate Logistic regression analysis was performed to identify influencing factors among groups, using the persistent irregular medical care group as reference. Results: A total of 444,126 outpatient visit records were collected from 8,922 hypertensive patients. GBTM model fitting results showed that the 5-group model was optimal for fitting medical seeking behavior trajectories: persistent regular group (39.84%), gradual decline group (25.36%), U-shaped change group (11.43%), gradual rise group (11.86%), and persistent irregular group (14.86%). Significant differences were found among the five groups in gender, age, hypertension course, diabetes history, transient ischemic attack history, and family history

(P<0.05). Using the persistent irregular group as reference, gender, age, hypertension course, family history, diabetes history, and transient ischemic attack history were all influencing factors for regularity pattern transitions (P<0.05). Female patients and those aged over 75 were more likely to transition from persistent irregular to persistent regular or early regular medical seeking behavior. Patients with diabetes and transient ischemic attack showed lower odds ratios for persistent irregular behavior. Prolonged hypertension course and family history were unfavorable for behavior pattern transitions. Conclusion: Regular medical seeking behavior among hypertensive patients requires long-term attention, with less than 40% of patients maintaining persistent regular care. For female patients, those over 75 years old, and those with diabetes or transient ischemic attack, appropriate management measures can facilitate the transition to and maintenance of regular medical seeking behavior. Further analytical studies are needed for other patient types to identify key factors for behavior transition and promote such transitions.

Full Text

Analysis of 8-Year Trajectories and Influencing Factors of Medical-Seeking Behavior Among Hypertensive Patients

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Abstract

Background: Hypertension has become a major disease threatening public health and affecting quality of life. Due to its prolonged course, numerous complications, and essentially incurable nature, patients require long-term medical care. Understanding the long-term trends and influencing factors of medical-seeking behavior among hypertensive patients is crucial for developing precise prevention and control strategies and health services.

Objective: To identify population-level medical-seeking behavior trajectories among community-managed hypertensive patients through group-based trajectory modeling, analyze their characteristics and behavioral transition factors, and provide evidence for hypertension prevention and treatment policies.

Methods: We selected 8,922 hypertensive patients with continuous records in community health 档案 since 2014. Medical visit information and follow-up management data from 2014–2021 were collected through the Resident Electronic Health Record System. Group-Based Trajectory Modeling (GBTM) was applied to analyze patterns of behavioral change, simulate transitions across different groups, and identify the optimal behavior trajectory model. Patient characteristics across different behavioral trajectories were compared using analysis of variance and chi-square tests. Using the persistently irregular medical-seeking group as the reference, multivariate logistic regression was employed to analyze influencing factors between trajectory groups.

Results: A total of 444,126 outpatient visit records were collected for 8,922 hypertensive patients. GBTM model fitting revealed that a 5-group model provided the best fit: sustained regular group (39.84%), gradual decline group (25.36%), U-shaped change group (11.43%), gradual increase group (11.86%), and persistently irregular group (14.86%). Statistically significant differences were observed among the five groups in gender, age, hypertension duration, diabetes history, transient ischemic attack history, and family history ($P<0.05$). Using the persistently irregular group as reference, gender, age, hypertension duration, family history, diabetes history, and transient ischemic attack history were all influencing factors for transitions in regular medical-seeking patterns ($P<0.05$). Female patients and those aged 75+ were more likely to transition from persistently irregular to sustained regular or early regular medical-seeking behavior. Patients with diabetes or transient ischemic attack showed lower odds ratios for persistently irregular behavior. Prolonged hypertension duration and family history were unfavorable for behavioral transitions.

Conclusion: Regular medical-seeking behavior among hypertensive patients requires long-term attention, with less than 40% maintaining sustained regular behavior. For female patients, those aged 75+, and those with diabetes or transient ischemic attack history, appropriate management measures can facilitate transitions to and maintenance of regular medical-seeking behavior. Further research is needed for other patient types to identify key factors for behavioral change.

Keywords: Hypertension; Medical-seeking behavior; Behavioral trajectories; Regular medical care; Behavioral change; Influencing factor analysis

1. Object and Methods

1.1 Study Subjects

Since 2012, Putuo District in Shanghai has established a Resident Electronic Health Record System that comprehensively documents diverse information including diagnosis and treatment, medical insurance, public health services, and performance for chronic disease patients within the district. In 2013, a chronic

disease management system was established to implement full-course hypertension patient management through information technology.

Inclusion criteria: (1) Hypertension 档案 management initiated before January 1, 2014; (2) Continuous receipt of hypertension health management services from 2014–2021; (3) At least 3 years of continuous hypertension-related visit records in the Resident Electronic Health Record System during 2014–2021.

Exclusion criteria: (1) Loss to follow-up for various reasons during 2014–2021, preventing continuous hypertension health management services; (2) Fewer than 3 continuous hypertension-related visit records in the Resident Electronic Health Record System during 2014–2021.

1.2 Survey Content and Methods

Medical-seeking behavior information: In July 2023, we extracted 444,126 outpatient visit records for hypertension-related visits at all levels of medical institutions in the district from 2014–2021 through the Electronic Health Record System, including hospital name and visit date.

Patient management information: Patient management and follow-up information were extracted from the Putuo District Chronic Disease Management System, including: (1) Demographic information: gender, age, occupation, residence type; (2) Disease history: diabetes history, cardiovascular and cerebrovascular disease history; (3) Behavioral and risk factors: family history of hypertension, smoking, alcohol consumption, regular exercise; (4) Physical examinations: height, weight, waist circumference, blood pressure.

1.3 Key Definitions

1.3.1 Regular medical care: According to chronic disease management guidelines, hypertensive patients should receive follow-up at least once every 3 months. We defined regular medical care as $ $4 visits per year with intervals $ $90 days; otherwise, it was considered irregular.

1.3.2 Medical institution type: Classified as general hospitals (including specialized hospitals) and community health service centers based on hospital nature.

1.3.3 Regularity score: 1 point for <4 visits per year with inconsistent medical institutions; 2 points for <4 visits per year with consistent institutions; 3 points for $ $4 visits per year with inconsistent institutions; 4 points for $ $4 visits per year with consistent institutions.

1.3.4 BMI criteria: BMI $\geq$ 28 kg/m^2 defined as obese; BMI $\geq$ 24 kg/m^2 as overweight; 18.5 kg/m^2 $\leq$ BMI $<$ 24 kg/m^2 as normal; BMI $<$ 18.5 kg/m^2 as underweight.

1.4 Quality Control

The entire hypertension patient management process employed strict quality control measures with regular assessments of data integrity and authenticity. Communities conducted quarterly self-inspections, while Putuo District CDC annually verified patient identity and disease information via telephone quality control, checking the authenticity of physical measurement data. Patient visit information originated from the Putuo District Information Platform, comprising outpatient data from medical institutions at all levels, ensuring authenticity and validity. Data collected through the Resident Health Record Platform and chronic disease patient management system were analyzed to ensure source validity. During data cleaning and processing, we strictly adhered to inclusion criteria while performing repair, transformation, and missing value imputation to ensure data integrity, accuracy, consistency, and usability.

1.5 Statistical Methods

Data analysis was performed using SPSS 22.0 software. Measurement data were expressed as ($\bar{x}\pm s$) with one-way ANOVA for multi-group comparisons. Count data were expressed as relative frequencies with chi-square tests for between-group comparisons. Statistical significance was set at $P<0.05$.

Behavioral trend analysis: Group-Based Trajectory Modeling (GBTM) was used to analyze patterns of medical-seeking behavior change, simulate behavioral transitions across different groups, and identify the optimal behavior model. GBTM group settings ranged from 1–5 groups, with each trajectory fitted using 1–3 degree polynomial equations. Model fit was evaluated using: (1) Bayesian Information Criterion (BIC), where smaller values indicate better fit; (2) Average Posterior Probability (AvePP), reflecting concordance between subgroup members and their assigned trajectory, with >0.7 generally considered acceptable; (3) Proportion of individuals with high posterior probability (>0.7) exceeding 65%.

Influencing factor analysis: Patient characteristics were compared across groups using ANOVA for continuous variables and chi-square tests for categorical variables. Using the persistently irregular medical-seeking group as reference, multivariate logistic regression analyzed influencing factors for transitions between trajectory groups. Variable assignments are shown in Table 1 .

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2. Results

2.1 Basic Characteristics

A total of 8,922 patients were included with mean age $(75.6\$\pm9.1)years, including3,667males(41.10\pm2.57)year$
See Table 2 .

2.2 Medical-Seeking Behavior Trend Analysis

GBTM analysis of 8,922 hypertensive patients from 2014–2021 revealed that a 5-group model with cubic function fitting provided the optimal fit (BIC=106,985.6). The five trajectory groups are:

1. **Sustained regular group** (n=3,255, 39.84%): Maintained regular medical-seeking behavior long-term with consistent medical institutions.
2. **Gradual decline group** (n=2,263, 25.36%): Initially regular behavior with gradual transition from consistent to inconsistent institutions, becoming increasingly irregular.
3. **U-shaped change group** (n=1,020, 11.43%): Regularity declined initially then slowly recovered but never reached regular care levels.
4. **Gradual increase group** (n=1,058, 11.86%): Initially poor regularity that gradually improved, reaching regular care standards by observation end.
5. **Persistently irregular group** (n=1,326, 14.86%): Maintained irregular medical-seeking behavior throughout with no significant improvement.

See Figure 1 [Figure 1: see original paper] and Table 3 .

2.3 Patient Characteristics Across Trajectory Groups

Significant differences were observed among the five groups in gender, age, hypertension duration, diabetes history, transient ischemic attack history, and family history ($P<0.05$). See Table 3 .

2.4 Influencing Factors for Behavioral Transitions

Using the persistently irregular group as reference and patient characteristics as independent variables (assignments in Table 1), multivariate logistic regression analyzed transition influencing factors. Results showed gender, age, hypertension duration, family history, diabetes history, and transient ischemic attack history were all significant factors ($P<0.05$). Female patients and those aged 75+ were more likely to transition from persistently irregular to sustained regular or early regular behavior. Patients with diabetes or transient ischemic attack showed lower odds ratios for persistently irregular behavior. Prolonged hypertension duration and family history were unfavorable for behavioral transitions. See Table 4 .

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3. Discussion

This study employed GBTM to analyze 8-year medical-seeking behavior trajectories among community-managed hypertensive patients. Only 39.48% maintained sustained regular behavior, while 14.86% remained persistently irregular throughout. With the National Essential Public Health Service requirement of

$ $4 annual follow-ups showing positive effects on blood pressure control, our finding that <40% maintained long-term regular behavior indicates substantial room for improvement in community hypertension management.

The "1+1+1" family doctor contract service implemented in Shanghai (one municipal hospital + one district hospital + one community hospital) can ensure care continuity across disease stages. Analysis of patient characteristics revealed that females and elderly individuals, particularly those aged 75+, were more likely to maintain long-term regular behavior, possibly due to higher health awareness and more fixed activity patterns, making them more amenable to consistent institutional care. This aligns with findings from Xiamen studies but contrasts with Taiwanese research showing irregular behavior among elderly populations, likely reflecting policy differences.

Our study also found that hypertension duration affected long-term behavior—patients with longer disease duration developed more irregular patterns, while newly diagnosed patients maintained better regularity. This may reflect initial disease concern and good compliance that wanes after blood pressure control or perceived recovery. However, behavioral changes over the 8-year observation may involve additional factors requiring further investigation.

Family history was associated with higher probability of irregular group membership, a novel finding possibly related to psychological factors or healthcare-seeking habits influenced by relatives' experiences. Patients with comorbid diabetes or transient ischemic attack showed distinct patterns, tending toward the gradual decline group (transitioning from consistent to inconsistent institutions), likely reflecting broader medical help-seeking beyond local institutions. This aligns with Xuzhou's analysis of chronic disease tiered diagnosis and treatment.

Importantly, female patients, those aged 75+, and those with diabetes or transient ischemic attack were more likely to transition from irregular to regular patterns, suggesting that targeted resource allocation—including health promotion, positive environment creation, institutional management enhancement, and improved patient experience—can effectively facilitate behavioral change. However, patients with prolonged disease duration and family history require more intensive interventions.

Limitations include reliance on regional electronic health records, potentially missing extra-regional visits, and underrepresentation of patients under 60, limiting generalizability. Further research is needed on persistently irregular patients and those with declining regularity to identify key transition factors. For patients under 60, alternative data sources are needed.

In conclusion, regular medical-seeking behavior among hypertensive patients requires sustained attention. Family doctor contract-based management should focus on patient education, behavioral promotion, and medical service delivery to cultivate regular habits. Local governments should leverage health policy, medical insurance services, and performance indicators to promote regular

medical-seeking, thereby slowing complication development and reducing healthcare costs and social burden.

References

[1] CHAI P P, ZHAI T M, WAN Q, et al. Calculation and analysis of treatment costs for cardiovascular and cerebrovascular diseases and basic medical insurance expenditures in China[J]. China Medical Insurance, 2021(1): 72-77. DOI:10.19546/j.issn.1674-3830.2021.1.016.

[2] LIU M B, HE X Y, YANG X H, et al. Key points interpretation of "Chinese Cardiovascular Health and Disease Report 2023"[J]. Chinese Journal of Cardiovascular Medicine, 2024, 29(4): 305-324. DOI:10.3969/j.issn.1007-5410.2024.04.002.

[3] HAI P C, XUAN L, ZHENG J, et al. Analysis of outpatient medical-seeking choices and influencing factors among Beijing medical insurance hypertensive patients[J]. Chinese Journal of Hospital Administration, 2022, 38(2): 115-120. DOI:10.3760/cma.j.cn111325-20211209-01119.

[4] ZENG Y B, XU W Q, CHEN L L, et al. The influencing factors of health-seeking preference and community health service utilization among patients in primary care reform in Xiamen, China[J]. Patient Prefer Adherence, 2020, 14: 653-662. DOI:10.2147/PPA.S242141.

[5] FRANKLIN J M, SHRANK W H, PAKES J, et al. Group-based trajectory models: a new approach to classifying and predicting long-term medication adherence[J]. Med Care, 2013, 51(9): 789-796. DOI:10.1097/MLR.0b013e3182984c1f.

[6] HUANG R C, DE KLERK N H, SMITH A, et al. Lifecourse childhood adiposity trajectories associated with adolescent insulin resistance[J]. Diabetes Care, 2011, 34(4): 1019-1025. DOI:10.2337/dc10-1809.

[7] National Health and Family Planning Commission. Notice on Issuing the "National Basic Public Health Service Standards (Third Edition)"[A/OL]. (2017-02-28)[2024-10-10]. http://www.nhc.gov.cn/jws/s3578/201703/d20c37e23e1f4c7db7b8e25f34473e1b.shtml.

[8] CHENG X R, ZHANG X T, LI M Y, et al. Study on the impact of chronic disease follow-up on health behaviors and blood pressure/blood glucose control among hypertensive and diabetic patients under the background of integrated medical prevention[J]. Chinese General Practice, 2023, 26(28): 3482-3488. DOI:10.12114/j.issn.1007-9572.2023.0275.

[9] QIN F, YANG L Z, CHEN L, et al. Qualitative study on influencing factors of community medical-seeking behavior in elderly patients with chronic comorbidities[J]. General Nursing, 2024, 22(4): 718-723.

[10] TSAI T H, HUANG N, LIN I F, et al. Variation in the 11-year trajectories of medical care seeking behaviors in diabetes patients under a single payer

system: persisting gaps to be filled[J]. BMC Health Serv Res, 2019, 19(1): 580. DOI:10.1186/s12913-019-4408-3.

[11] General Office of the State Council. Notice on Issuing the "China Chronic Disease Prevention and Treatment Medium and Long-term Plan (2017–2025)"[A/OL]. (2017-02-14)[2024-10-10]. https://www.gov.cn/zhengce/content/2017-02/14/content_{5167886}.htm.

[12] NIE L L, MAO C Q, YANG X G, et al. Current situation survey of extended prescriptions for chronic disease patients in communities[J]. Chinese General Practice, 2021, 24(12): 1552-1555. DOI:10.12114/j.issn.1007-9572.2021.00.139.

[13] G/TSADIK D, BERHANE Y, WORKU A. Adherence to antihypertensive treatment and associated factors in central Ethiopia[J]. Int J Hypertens, 2020, 2020: 9540810. DOI:10.1155/2020/9540810.

[14] LI Y Y, ZHANG D, LIU X Y, et al. Study on medical-seeking behavior of rural chronic disease patients from the perspective of social determinants of health[J]. Medicine and Society, 2015, 28(9): 38-41. DOI:10.13723/j.yxysh.2015.09.012.

[15] LI H Y, JIANG J X, ZHAO Q Y, et al. Analysis of influencing factors on medical-seeking choices of chronic disease patients under the tiered diagnosis and treatment system in Xuzhou[J]. Chinese General Practice, 2020, 23(12): 1546-1551. DOI:10.12114/j.issn.1007-9572.2020.00.036.

[16] PAN H W, LIU L, MA C, et al. Study on treatment adherence and influencing factors of national chronic disease management services for hypertensive population in community health service centers[J]. Chinese General Practice, 2024, 27(1): 59-66. DOI:10.12114/j.issn.1007-9572.2023.0170.

[17] Writing Group of Primary Health Management Standards for Hypertension, Hyperglycemia and Hyperlipidemia. Primary health management standards for hypertension, hyperglycemia and hyperlipidemia[J]. Prevention and Treatment of Cardio-Cerebro-Vascular Disease, 2024, 24(7): 1-14. DOI:10.3969/j.issn.1009-816x.2024.07.001.

[18] WANG J, SUN X R, YANG F, et al. Cost-effectiveness analysis of hypertension health management in national basic public health services[J]. Medicine and Society, 2024, 37(3): 20-26. DOI:10.13723/j.yxysh.2024.03.004.

Received: October 15, 2024; Revised: April 21, 2025
(Edited by CUI Sha)

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