Postprint: A Study on the Impact of Chronic Disease Follow-up on Health Behaviors and Blood Pressure/Blood Glucose Control in Patients with Hypertension and Diabetes in the Context of Treatment-Prevention Integration

Authors: Cheng Xiaoran, Zhang Xiaotian, Li Mingyue, Cheng Haozhe, Tang Haoqing, Zheng Huixian, Zhang Baisong, Liu Xiaoyun, Liu Xiaoyun

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Abstract

Background: Hypertension and diabetes are two major chronic diseases affecting population health, and patients require long-term chronic disease follow-up to control their conditions. However, there is insufficient understanding of how different follow-up modalities and contents under the integration of medical care and preventive care influence disease control and health behavior formation in chronic disease patients.

Objective: To investigate the impact of chronic disease follow-up under the integration of medical care and preventive care on health behaviors and blood pressure/blood glucose control in patients with hypertension and diabetes.

Methods: Yiyang County in Henan Province, Xianfeng County in Hubei Province, and Yangqu County in Shanxi Province were selected as study sites. Data from the basic public health information system were collected from January 1, 2017 to June 30, 2022, and a patient survey was conducted in July 2022 to collect information on patients' receipt of basic public health follow-up, health behaviors, and disease control status. Ultimately, data on 102,769 hypertensive patients and 26,586 diabetic patients were obtained from the basic public health information system, while data on 1,172 hypertensive patients and 456 diabetic patients were obtained through the patient survey. Multivariate Logistic regression analysis was used to examine the effects of follow-up frequency compliance, follow-up modality, and follow-up content on patient health behaviors and disease control.

Results: In 2021, the follow-up compliance rate ($ $4 visits/year) was 90.83%

(67,709/74,545) for hypertensive patients and 83.35% (13,390/16,065) for diabetic patients. Follow-up modalities included home visits [25.74% (408/1,585)], follow-up during medical institution visits [58.80% (932/1,585)], and telephone or online follow-up [15.46% (245/1,585)]. Follow-up contents included blood pressure and blood glucose measurement [91.15% (1,484/1,628)], lifestyle guidance [74.14% (1,207/1,628)], inquiry about disease conditions [70.02% (1,140/1,628)], and understanding medication use [69.29% (1,128/1,628)]. Multivariate Logistic regression analysis revealed that patients with adequate follow-up frequency had higher rates of blood pressure control (OR=1.09, P<0.05) and blood glucose control (OR=1.31, P<0.05), lower proportions of smoking and alcohol consumption (OR=0.83, P<0.05), and higher proportions of regular exercise habits (OR=1.30, P<0.05). Patients with follow-up during medical institution visits had higher proportions of smoking/alcohol cessation (OR=2.38, P<0.05) and regular exercise habits (OR=1.62, P<0.05) compared to those with telephone or online follow-up; patients with home visits also had higher proportions of smoking/alcohol cessation (OR=2.33, P<0.05) and regular exercise habits (OR=2.54, P<0.05) compared to those with telephone or online follow-up. Patients whose follow-up primarily included lifestyle guidance, inquiry about disease conditions, and understanding medication use had higher blood pressure control rates (OR=1.61, 1.34, and 1.62 respectively, all P<0.05), higher proportions of smoking/alcohol cessation (OR=3.59, 3.54, and 2.91 respectively, all P<0.05), and higher proportions of regular exercise habits (OR=3.16, 2.15, and 2.45 respectively, all P<0.05).

Conclusion: Receiving at least four chronic disease follow-up visits annually, with follow-up modalities of during-visit follow-up and home visits, and providing follow-up services including blood pressure/blood glucose measurement, lifestyle guidance, inquiry about disease status, and understanding medication use, are positively associated with patients' blood pressure/blood glucose control levels, smoking/alcohol cessation, and formation of regular exercise habits.

Full Text

Abstract

Background: Hypertension and diabetes are two major chronic diseases affecting population health and require control through chronic disease follow-up. However, there is currently insufficient understanding of how different follow-up modalities and contents impact disease control and healthy behaviors among patients.

Objective: To explore the impact of chronic disease follow-up on health behaviors and blood pressure/glucose control among patients with hypertension and diabetes within an integrated treatment-prevention framework.

Methods: Data were collected from the basic public health information systems of Yiyang County in Henan Province, Xianfeng County in Hubei Province, and

Yangqu County in Shanxi Province between January 1, 2017, and June 30, 2022. A patient survey was conducted in July 2022 to gather information on receipt of basic public health follow-up services, health behaviors, and disease control. Ultimately, data for 102,769 hypertensive patients and 26,586 diabetic patients were obtained from the basic public health information system, while survey data were collected from 1,172 hypertensive patients and 456 diabetic patients. Multivariate logistic regression was used to analyze the effects of follow-up frequency compliance, follow-up modalities, and follow-up contents on patient health behaviors and blood pressure/glucose control.

Results: In 2021, the compliance rates for follow-up frequency were 90.83% (67,709/74,545) for hypertensive patients and 83.35% (13,390/16,065) for diabetic patients, using $ $4 times per year as the standard. The follow-up modalities included household visits [25.74% (408/1,585)], institutional visits [58.80% (932/1,585)], and telephone or online follow-up [15.46% (245/1,585)]. Follow-up contents comprised blood pressure and blood glucose measurements [91.15% (1,484/1,628)], lifestyle guidance [74.14% (1,207/1,628)], disease inquiry [70.02% (1,140/1,628)], and medication use assessment [69.29% (1,128/1,628)]. Multivariate logistic regression analysis revealed that patients with higher follow-up frequency compliance had higher rates of blood pressure control (OR=1.09, P<0.05) and glucose control (OR=1.31, P<0.05), lower rates of smoking and alcohol consumption (OR=0.83, P<0.05), and higher rates of regular exercise habits (OR=1.30, P<0.05). Patients who received follow-up during institutional visits had higher proportions of smoking/alcohol cessation (OR=2.38, P<0.05) and regular exercise habits (OR=1.62, P<0.05) compared to those followed up by telephone or online methods. Patients who received household follow-up also had higher proportions of smoking/alcohol cessation (OR=2.33, P<0.05) and regular exercise habits (OR=2.54, P<0.05) compared to telephone or online follow-up. Patients who received lifestyle guidance, disease inquiry, and medication use assessment had higher rates of blood pressure control (OR=1.61, 1.34, and 1.62, respectively; P<0.05), smoking/alcohol cessation (OR=3.59, 3.54, and 2.91, respectively; P<0.05), and regular exercise habits (OR=3.16, 2.15, and 2.45, respectively; P<0.05).

Conclusion: Receiving chronic disease follow-up at least 4 times per year, with institutional visits and household follow-up as modalities, and including blood pressure/blood glucose measurements, lifestyle guidance, disease inquiry, and medication use assessment as contents, was positively correlated with blood pressure/glucose control, smoking/alcohol cessation, and regular exercise habits.

Keywords: Hypertension; Diabetes; Integrated medical and preventive services; Chronic disease follow-up; Health behaviors; Blood pressure control; Glycemic control

With economic development, population aging, and changes in disease patterns, chronic non-communicable diseases have become the most significant health threat and source of disease burden in China. In 2018, the prevalence of chronic diseases in China was 34.3%, affecting approximately 480 million people [1], with

approximately 9.26 million deaths attributable to chronic diseases, accounting for 89% of total deaths, of which 17% were premature [2]. Hypertension and diabetes are two major diseases threatening the health of Chinese people. According to the sixth national hypertension survey, the standardized prevalence of hypertension among Chinese adults aged 18-69 was 24.7% in 2018, with only about 34.6% of patients receiving adequate treatment and approximately 38.3% achieving blood pressure control [3]. Stroke and ischemic heart disease caused by hypertension currently represent the two heaviest disease burdens among the global population over 50 [4]. The prevalence of diabetes among Chinese adults is approximately 12.4%, with a treatment rate of 32.9%, and only 50.1% of patients effectively controlling their blood glucose [5-6]. The annual growth rate of direct costs for diabetes in China is projected to reach 5.98% between 2020-2030, with the total cost of diabetes growing faster than China' s GDP [5-6]. There remains considerable room for improvement in the control of hypertension and diabetes in China.

The World Health Organization notes that chronic diseases are influenced by numerous factors, including individual health literacy, health behaviors, and healthcare systems, all of which affect patient outcomes. Therefore, comprehensive chronic disease management is needed for patients with chronic conditions [7]. Integrated medical and preventive services represent an important institutional framework for chronic disease management, improving health outcomes and slowing disease progression, and represent the future direction of primary healthcare development [7-9]. Several scholars have examined the impact of follow-up frequency on blood pressure/glucose control [10-12] and patient health behaviors [13-14], but few studies have evaluated how different follow-up modalities and contents relate to blood pressure/glucose control and health behavior formation. The "China-Gates Foundation Rural Basic Health Care Project" implements integrated medical and preventive services by constructing an integrated healthcare delivery system in rural areas. Based on this project, this study analyzes how different follow-up modalities and contents affect blood pressure/glucose control and smoking/alcohol cessation and regular exercise behaviors among patients, providing evidence for evaluating the effectiveness of chronic disease follow-up.

1. Subjects and Methods

This study was approved by the Peking University Biomedical Ethics Committee (approval number: IRB00001052-22155) and was conducted in July 2022. The study selected three sites from the "China-Gates Foundation Rural Basic Health Care Project" : Yiyang County in Henan Province, Xianfeng County in Hubei Province, and Yangqu County in Shanxi Province. Data collection consisted of two parts: (1) extraction of information on hypertensive and diabetic patients registered in the system from January 1, 2017, to June 30, 2022, from county-level and township basic public health information systems; and (2) questionnaire surveys of hypertensive and diabetic patients registered before

June 30, 2022, in each county using a multi-stage random sampling method.

1.1 Basic Public Health Information System Data Extraction

Follow-up data from January 1, 2017, to June 30, 2022, were exported from county-level and township basic public health systems. Information was screened for patients registered as hypertensive or diabetic, including gender, age, follow-up visits, blood pressure/glucose control status, and behavioral information such as smoking/alcohol consumption and exercise. Ultimately, data for 102,769 hypertensive patients and 26,586 diabetic patients were obtained.

1.2 Questionnaire Survey

In each evaluation county, three townships were selected through convenience sampling. Using quota sampling, 150 patients registered before June 30, 2022, were randomly selected from each township, including 100 hypertensive patients and 50 diabetic patients, totaling 1,628 surveyed patients (1,172 hypertensive and 456 diabetic). Surveys were conducted through household visits and by gathering patients at village clinics. Surveyors were local healthcare practitioners trained by teachers and graduate students from our research group. The survey primarily covered: basic demographic characteristics (gender, age, family income, education, marital status, employment type), receipt of public health services (follow-up status, modality and content of most recent follow-up, travel time to nearest healthcare facility), health behaviors (smoking/alcohol cessation, regular exercise habits), and disease control status (blood pressure and glucose control).

1.3 Evaluation Criteria and Indicator Definitions

(1) According to the *National Basic Public Health Service Standards*, follow-up frequency compliance was defined as $ $4 visits per year [15]. (2) For hypertensive patients receiving basic public health follow-up services, blood pressure control was defined as systolic pressure <140 mmHg and diastolic pressure <90 mmHg. (3) For diabetic patients receiving basic public health follow-up services, glucose control was defined as fasting blood glucose <7.0 mmol/L. (4) In the patient survey, follow-up modality and content were determined by asking patients "What type (content) of hypertension/diabetes follow-up service did you receive most recently?"

1.4 Statistical Methods

Stata 17.0 software was used for data cleaning and analysis. Categorical data were expressed as relative frequencies. Descriptive analysis included patient demographics, follow-up status, health behaviors, and blood pressure/glucose control. Logistic regression was used to analyze the impact of previous-year follow-up frequency compliance, follow-up modality, and follow-up content on

health behaviors and blood pressure/glucose control. Follow-up modality and content were based on patient questionnaire data, while previous-year follow-up frequency was based on basic public health system data to avoid recall bias. P<0.05 was considered statistically significant.

2. Results

2.1 Basic Patient Characteristics

In the extracted basic public health information system data, 59.71% (58,039/97,197) of patients were female, and 72.99% (94,416/129,335) were aged $ $65 years. In the questionnaire survey data, 63.96% (1,040/1,626) were female, 60.75% (989/1,628) were aged $ $65 years, 78.82% (1,280/1,624) were Han Chinese, 57.57% (935/1,624) had primary school education or below, 83.32% (1,344/1,616) were married, 70.27% (1,144/1,628) had a family annual income $ $20,000 yuan, 90.91% (1,480/1,628) were farmers/unemployed, and 90.60% (1,475/1,628) could reach the nearest healthcare facility within 15 minutes. See Table 1 .

2.2 Patient Follow-up Status

(1) According to data exported from the basic public health information system, 90,610 patients (70.06%) received follow-up in 2021, with a follow-up frequency compliance rate of 85.51% (61,998/72,059). Specifically, the compliance rates were 90.83% (67,709/74,545) for hypertensive patients and 83.35% (13,390/16,065) for diabetic patients. See Table 2 . (2) Based on questionnaire survey data regarding the most recent follow-up modality, 25.74% (408/1,585) received household visits, 58.80% (932/1,585) received follow-up during institutional visits, and 15.46% (245/1,585) received telephone or online follow-up. (3) Regarding follow-up content, 91.15% (1,484/1,628) received blood pressure/glucose measurements, 74.14% (1,207/1,628) received lifestyle guidance, 70.02% (1,140/1,628) had their disease status inquired about, and 69.29% (1,128/1,628) had their medication use assessed. See Table 3 .

2.3 Patient Health Behaviors and Blood Pressure/Glucose Control

Among patients with compliant follow-up frequency, the smoking/alcohol consumption rate was 8.20% (6,650/81,099), 50.10% (40,631/81,099) had regular exercise habits, 66.34% (44,918/67,709) of hypertensive patients had good blood pressure control, and 72.50% (9,708/13,390) had good glucose control. Among patients receiving household follow-up, 29.90% (122/408) followed medical advice to quit smoking/alcohol, 83.58% (341/408) developed regular exercise habits, 62.54% (192/307) of hypertensive patients had good blood pressure control, and 50.50% (51/101) had good glucose control. Among patients whose main follow-up content included lifestyle guidance, 30.32% (366/1,207) quit smoking/alcohol, 79.45% (959/1,207) had regular exercise habits, 66.39%

(567/854) of hypertensive patients had good blood pressure control, and 42.21% (149/353) of diabetic patients had good glucose control. See Table 4 .

2.4 Impact of Follow-up on Patient Health Behaviors and Blood Pressure/Glucose Control

2.4.1 Impact of Follow-up on Patient Health Behaviors

(1) Using smoking/alcohol consumption and regular exercise habits as dependent variables and previous-year follow-up frequency compliance as the independent variable, multivariate logistic regression analysis showed that patients with compliant follow-up frequency had lower smoking/alcohol consumption rates [OR (95%CI) = 0.83 (0.79, 0.88)] and higher proportions of regular exercise habits [OR (95%CI) = 1.30 (1.26, 1.34)]. (2) Using smoking/alcohol consumption and regular exercise habits as dependent variables and follow-up modality as the independent variable, multivariate logistic regression analysis revealed that compared to patients receiving telephone or online follow-up, those receiving follow-up during institutional visits had higher smoking/alcohol cessation rates [OR (95%CI) = 2.38 (1.68, 3.37)] and higher proportions of regular exercise habits [OR (95%CI) = 1.62 (1.23, 2.14)], while patients receiving household follow-up also had higher smoking/alcohol cessation rates [OR (95%CI) = 2.33 (1.51, 3.61)] and higher proportions of regular exercise habits [OR (95%CI) = 2.54 (1.61, 3.88)]. (3) Using smoking/alcohol consumption and regular exercise habits as dependent variables and follow-up contents as independent variables, multivariate logistic regression analysis showed that patients who received blood pressure/glucose measurements had higher proportions of regular exercise habits [OR (95%CI) = 3.72 (2.08, 6.65)], those who received lifestyle guidance had higher smoking/alcohol cessation rates [OR (95%CI) = 3.59 (2.49, 5.17)] and higher proportions of regular exercise habits [OR (95%CI) = 3.16 (2.42, 4.11)], those whose disease status was inquired about had higher smoking/alcohol cessation rates [OR (95%CI) = 3.54 (2.51, 5.01)] and higher proportions of regular exercise habits [OR (95%CI) = 2.15 (1.66, 2.78)], and those whose medication use was assessed had higher smoking/alcohol cessation rates [OR (95%CI) = 2.91 (2.10, 4.01)] and higher proportions of regular exercise habits [OR (95%CI) = 2.45 (1.89, 3.16)]. See Table 5 .

2.4.2 Impact of Follow-up on Patient Blood Pressure/Glucose Control

(1) Using blood pressure control and glucose control as dependent variables and previous-year follow-up frequency compliance as the independent variable, multivariate logistic regression analysis showed that patients with compliant follow-up had higher blood pressure control rates [OR (95%CI) = 1.09 (1.07, 1.12)] and higher glucose control rates [OR (95%CI) = 1.31 (1.25, 1.38)]. (2) Using blood pressure control and glucose control as dependent variables and follow-up modality as the independent variable,

multivariate logistic regression analysis showed that different follow-up modalities had no significant impact on blood pressure/glucose control (P>0.05). (3) Using blood pressure control and glucose control as dependent variables and follow-up contents as independent variables, multivariate logistic regression analysis revealed that patients who received lifestyle guidance had higher blood pressure control rates [OR (95%CI) = 1.61 (1.19, 2.19)], those whose disease status was assessed had higher blood pressure control rates [OR (95%CI) = 1.34 (1.02, 1.75)], and those whose medication use was assessed had higher blood pressure control rates [OR (95%CI) = 1.62 (1.20, 2.17)]. However, follow-up contents showed no significant impact on glucose control among diabetic patients (P>0.05). See Table 6 .

3. Discussion

3.1 Chronic Disease Follow-up Frequency $ $4 Times/Year Positively Affects Blood Pressure/Glucose Control and Exercise Habits, Negatively Affects Smoking/Alcohol Consumption

Chronic disease follow-up is an essential component of chronic disease management in basic public health services and a crucial measure for building integrated healthcare delivery and promoting integrated medical and preventive services. This study found that the follow-up frequency compliance rates were relatively high among the included diabetic and hypertensive patients, exceeding 80% for diabetic patients and 90% for hypertensive patients in 2021. Patients with compliant follow-up frequency in the previous year had higher blood pressure/glucose control rates, lower proportions of smoking/alcohol consumption, and higher proportions of regular exercise habits.

A random sampling survey of hypertensive patients in Luzhou City showed that patients with compliant follow-up frequency had higher rates of good hypertension control than non-compliant patients (OR=1.444) [10]. SUN et al. [11] used stricter criteria for good hypertension control (systolic pressure <130 mmHg, diastolic pressure <80 mmHg) and employed a randomized controlled trial design to examine the effects of standardized management for rural hypertensive patients. Results showed significant improvement in blood pressure control after 18 months of follow-up, with a 37% difference in blood pressure between control and intervention groups and an average reduction of 26.3 mmHg in systolic pressure in the intervention group. Regarding the relationship between follow-up frequency and smoking/alcohol behavior and exercise habit formation: a study in Xiamen found that the proportion of hypertensive patients with exercise habits increased by 7.3 percentage points under the "three-division co-management" model [13]; a study in Taiyuan found that smoking rates decreased by 4.6 percentage points and alcohol consumption rates decreased by 4.7 percentage points among hypertensive patients receiving community-based chronic disease management [16]. The mechanism by which follow-up improves lifestyle habits may be that the professionalism of physicians increases patient attention

to their advice, making lifestyle recommendations and medication adherence suggestions more likely to be adopted, thereby influencing blood pressure/glucose control [11].

3.2 Institutional Visits and Household Follow-up Have Positive Effects on Smoking/Alcohol Cessation and Regular Exercise, But Do Not Promote Blood Pressure/Glucose Control

The *National Basic Public Health Service Standards* include follow-up modalities such as outpatient visits, telephone or online follow-up, and household visits. This study found that compared to telephone or online follow-up, patients receiving follow-up during institutional visits or household visits had higher probabilities of following medical advice to quit smoking/alcohol and exercise regularly, but these modalities showed no significant effect on blood pressure/glucose control.

HAO Jihong [17] found a positive relationship between telephone follow-up and blood pressure control, which is inconsistent with our findings. ZUO et al. [18] confirmed that for hypertensive patients after outpatient visits, disease improvement was related to both medication adherence and visit intensity, with better blood pressure control among patients with stronger medication adherence and higher visit intensity. Therefore, we speculate that the reasons why different follow-up modalities in this study showed no impact on blood pressure/glucose control but did affect health behaviors may be twofold: first, follow-up may exert its effects through medication adherence indicators not included in this study, while its improvement of patient medication adherence is limited [11]; second, improvements in patient lifestyle habits may be insufficient to meet the standards required for blood pressure/glucose control.

3.3 Different Follow-up Contents Have Varying Effects on Blood Pressure/Glucose Control and Health Behaviors

This study found that follow-up contents including lifestyle guidance, disease status inquiry, and medication use assessment had positive effects on smoking/alcohol cessation and regular exercise habit formation, while blood glucose measurement content positively affected regular exercise habit formation, and lifestyle guidance and medication use assessment positively affected blood pressure control. However, different follow-up contents showed no significant impact on glucose control among diabetic patients. These results differ from those of XU Hai et al. [19] and WU Long et al. [20]. This discrepancy may be due to: first, insufficient medication adherence and lifestyle changes among patients to promote blood pressure/glucose improvement [18]; second, the influence of follow-up physicians' capabilities, where lifestyle improvement recommendations provided by doctors may not meet patient needs, resulting in inadequate lifestyle changes that affect blood pressure/glucose control. For example, URITANI et al. [21] compared their study protocol with previous research and suggested that exercise recommendations in physicians' non-medical prescriptions did not reach

sufficient intensity, preventing patients from achieving blood pressure/glucose control even after behavior changes. LIN Shiliang [22] found that the minimum effective exercise duration for diabetic patients to achieve glucose reduction was 33 minutes per day for 5 weeks, which is challenging for rural elderly without exercise concepts. Diabetes is a metabolic disease requiring comprehensive attention to diet, regular exercise, and other lifestyle behaviors [23-24], with different healthy behaviors needed during work, social activities, and rest, making management more difficult [25-27]. The chronic disease patients included in this study were primarily elderly patients from impoverished areas, where healthy lifestyle habit formation is difficult, affecting management effectiveness. This suggests that chronic disease management should focus more on personalized interventions and lifestyle recommendations, providing different types of lifestyle advice based on patients' living contexts and conditions, while also attending to physicians' professional capabilities to ensure they can prescribe appropriate lifestyle behavior prescriptions based on patient characteristics.

In summary, chronic disease follow-up is associated with blood pressure/glucose control and the formation of smoking/alcohol cessation and regular exercise habits. Future efforts should strengthen supervision of chronic disease follow-up services in basic public health programs, including: (1) Using monitoring and financial incentives to motivate village doctors to conduct chronic disease follow-up and maintain high compliance rates. For example, training and workflow restructuring can enable village doctors to provide follow-up services during patient consultations, while providing medical equipment, transportation, and subsidies can improve their enthusiasm for household visits, and registering follow-up modalities and contents with post-hoc verification can ensure service delivery. (2) Strengthening training for village doctors to improve their ability to diagnose and prescribe lifestyle behavior recommendations, ensuring they can provide appropriate and adequate lifestyle and treatment advice.

This study has several limitations: (1) Follow-up modality and content were determined by patient recall of their most recent follow-up, which may not represent overall follow-up experiences and may be subject to recall bias; (2) The study sites were selected from rural areas in underdeveloped regions, and whether the conclusions can be generalized to other areas requires further research.

Author Contributions: CHENG Xiaoran and LIU Xiaoyun conceived and designed the study; CHENG Xiaoran performed data processing and analysis, wrote the manuscript, and takes responsibility for the article; ZHANG Xiaotian and LIU Xiaoyun implemented and managed the research; LI Mingyue, CHENG Haozhe, TANG Haoqing, ZHENG Huixian, and ZHANG Baisong collected and organized data; LIU Xiaoyun provided guidance, quality control, and manuscript review.

Conflict of Interest: The authors have no conflicts of interest.

References

[1] National Health Commission Statistical Information Center. Report on the Sixth National Health Services Survey 2018 [M]. Beijing: People' s Medical Publishing House, 2021.

[2] World Health Organization. Noncommunicable diseases: progress monitor 2020 [R]. Geneva: World Health Organization, 2020.

[3] ZHANG M, SHI Y, ZHOU B, et al. Prevalence, awareness, treatment, and control of hypertension in China, 2004-18: findings from six rounds of a national survey [J]. BMJ, 2023, 380: e071952. DOI: 10.1136/bmj-2022-071952.

[4] GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019 [J]. Lancet, 2020, 396(10258): 1204-1222. DOI: 10.1016/s0140-6736(20)30925-9.

[5] LIU J L, LIU M, CHAI Z L, et al. Projected rapid growth in diabetes disease burden and economic burden in China: a spatio-temporal study from 2020 to 2030 [J]. Lancet Reg Health West Pac, 2023, 33: 100700. DOI: 10.1016/j.lanwpc.2023.100700.

[6] WANG L M, PENG W, ZHAO Z P, et al. Prevalence and treatment of diabetes in China, 2013–2018 [J]. JAMA, 2021, 326(24): 2498-2506. DOI: 10.1001/jama.2021.22208.

[7] World Health Organization. Primary health care: closing the gap between public health and primary care through integration [R]. Geneva: World Health Organization, 2018.

[8] HUANG Xiaoxu, LI Ziyun, WANG Zhaoxin, et al. Current status and key issues of chronic disease follow-up in medical institutions [J]. Chinese General Practice, 2020, 23(28): 3522-3526. DOI: 10.12114/j.issn.1007-9572.2020.00.290.

[9] ZHANG Lingling, LIANG Liming, SUN Huajun, et al. Effect of health management follow-up services on medication adherence in hypertensive patients [J]. Chinese Journal of Public Health, 2021, 37(2): 354-357. DOI: 10.11847/zgggws1125164.

[10] TIAN Haiyan, JIANG Hangyu, ZHANG Rong, et al. Analysis of blood pressure control and influencing factors in health management of hypertensive patients [J]. Modern Preventive Medicine, 2021, 48(5): 893-896.

[11] SUN Y, MU J, WANG D W, et al. A village doctor-led multifaceted intervention for blood pressure control in rural China: an open, cluster randomised trial [J]. The Lancet, 2022, 399(10339): 1964-1975.

[12] ZHAO Xuan, YU Menggen, YU Yahang, et al. Impact of primary care operating environment on blood glucose control in diabetic patients under integrated health system reform [J]. Chinese Journal of Health Policy, 2021, 14(1):

37-43. DOI: 10.3969/j.issn.1674-2982.2021.01.006.

[13] HUA Qingmei, ZHANG Ziguan, YU Lingling, et al. Evaluation of hypertension management effectiveness under the "three-division co-management" model in Xiamen [J]. Chinese Journal of Hypertension, 2020, 28(7): 671-675. DOI: 10.16439/j.cnki.1673-7245.2020.07.016.

[14] MIRSKY J B, BUI T X V, GRADY C B, et al. Hypertension control and medication titration associated with lifestyle medicine virtual group visits and home blood pressure monitoring [J]. 10.1177/15598276221108060.

[15] TANG Xuefeng, HUANG Lei, LI Youping, et al. Research progress on performance evaluation indicator system for health management of type 2 diabetic patients [J]. Journal of Preventive Medicine Information, 2018, 34(2):

[16] ZHANG Qi, XU Zhihong, ZHANG Ling, et al. Study on the effectiveness of community health management for hypertensive patients based on regional medical consortium [J]. Chinese General Practice, 2015, 18(1): 81-84. DOI: 10.3969/j.issn.1007-9572.2015.01.021.

[17] HAO Jihong. Effectiveness analysis of face-to-face follow-up versus telephone follow-up for 120 community patients with primary hypertension [J]. World Latest Medicine Information, 2018, 18(87): 111, 122. DOI: 10.19613/j.cnki.1671-3141.2018.87.076.

[18] ZUO H J, MA J X, WANG J W, et al. The impact of routine follow-up with health care teams on blood pressure control among patients with hypertension [J]. J Hum Hypertens, 2019, 33(6): 466-474. DOI: 10.1038/s41371-018-0158-7.

[19] XU Hai, CHEN Xiaorong, HOU Lei, et al. Standardized management status and its impact on blood glucose control in community patients with type 2 diabetes [J]. Chinese Journal of Prevention and Control of Chronic Diseases, 2017, 25(1): 25-28. DOI: 10.16386/j.cjpccd.issn.1004-6194.2017.01.007.

[20] WU Long, JIAO Huiyan, WU Na, et al. Study on influencing factors of blood pressure control effectiveness in community-managed patients with primary hypertension [J]. Journal of Third Military Medical University, 2017, 39(18): 1865-1870. DOI: 10.16016/j.1000-5404.201703076.

[21] URITANI D, MATSUMOTO D, ASANO Y, et al. Effects of regular exercise and nutritional guidance on body composition, blood pressure, muscle strength and health-related quality of life in community-dwelling Japanese women [J]. Obes Res Clin Pract, 2013, 7(2): e155-e163. DOI: 10.1016/j.orcp.2011.10.005.

[22] LIN Shiliang. Study on the minimum effective exercise duration for type 2 diabetic patients [D]. Beijing: Beijing Sport University, 2004.

[23] QU Minwen, WANG Lingjie. Effectiveness analysis of community standardized management for elderly patients with hypertension and diabetes [J]. World Latest Medicine Information, 2018, 18(87): 111, 122. DOI: 10.19613/j.cnki.1671-3141.2018.87.076.

[24] LIU Qin, ZHU Huijun, LIU Wei, et al. Effectiveness evaluation of personalized health management for community diabetic patients [J]. Journal of Nursing Science, 2018, 33(18): 86-89. DOI: 10.3870/j.issn.1001-4152.2018.18.086.

[25] JIN Xiaowei, MEI Kewen, SHENG Xiaomei, et al. Clinical application of "three-day method" continuous glucose monitoring in guiding lifestyle intervention for diabetes [J]. Jiangsu Medical Journal, 2014, 40(20): 2447-2449. DOI: 10.19460/j.cnki.0253-3685.2014.20.025.

[26] GUO Tian, DING Xianbin, ZHANG Chunhua, et al. Evaluation of intervention effectiveness of healthy lifestyle instructors in rural areas [J]. Chinese Journal of Health Education, 2015, 31(4): 375-378.

[27] DAI Yun. Effect of lifestyle intervention on blood glucose levels in type 2 diabetes [J]. Electronic Journal of Clinical Medical Literature, 2020, 7(15): 13. DOI: 10.16281/j.cnki.jocml.2020.15.010.

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