

Effectiveness of Individualized Health Education Intervention for Community-Dwelling Middle-Aged and Older Patients with Chronic Diseases: A Cluster Randomized Controlled Trial Post-print

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Abstract

Background: The frequent occurrence of chronic diseases is associated with patients' insufficient understanding of health knowledge and disease risks. Nationwide, traditional health education methods remain widespread in community health services. Primary care physicians provide health education with limited forms and lack of targeted content. Residents' enthusiasm for participating in health education is generally insufficient. The quality and effectiveness of health education for chronic disease patients need improvement.

Objective: To investigate the effectiveness of individualized health education interventions generated through an informatized knowledge base model for middle-aged and elderly chronic disease populations in communities, and to provide references for enhancing community chronic disease management.

Methods: In 2021, 7,390 patients aged 50-70 years with four chronic diseases (hypertension, diabetes, coronary heart disease, and stroke) were selected from community health service centers in Dongcheng District, Beijing, for a 1-year cluster randomized controlled trial. The control group received conventional chronic disease follow-up management (maintaining existing basic public health services for chronic diseases). The intervention group received, in addition to conventional management, follow-up using an informatized knowledge base model to generate health education guidance protocols, which included health education prescription guidance and individualized health management, with follow-up and intervention every 3 months for 12 months. An endline survey was conducted 1 year after enrollment. This study analyzed differences between baseline and endline data between the two groups in terms of "chronic disease

knowledge awareness rate, self-management attitude, self-efficacy, medication adherence, and health informatization acceptance.”

Results: A total of 7,390 patients with four chronic diseases were included (3,673 in the intervention group and 3,717 in the control group). No statistically significant differences were found between groups in age distribution, gender, education level, or employment status ($P>0.05$). A statistically significant difference was found in medical insurance type ($P<0.05$). Post-intervention, the intervention group showed higher correct awareness rates for overall disease knowledge, basic chronic disease knowledge, diabetes knowledge, coronary heart disease knowledge, and stroke knowledge compared to baseline ($P<0.05$), with no significant difference in hypertension knowledge awareness ($P>0.05$). The control group showed no significant differences post-intervention in awareness rates for overall disease knowledge, basic chronic disease knowledge, hypertension knowledge, diabetes knowledge, or coronary heart disease knowledge ($P>0.05$), while stroke knowledge awareness rate was lower than baseline ($P<0.05$). Post-intervention scores on the self-management attitude, self-efficacy, medication adherence, and health informatization acceptance questionnaires were higher in the intervention group than in the control group ($P<0.05$). The intervention group’s post-intervention scores on all four questionnaires were higher than baseline ($P<0.05$). The control group’s post-intervention scores on self-efficacy and medication adherence questionnaires were higher than baseline ($P<0.05$), with no significant differences in self-management attitude or health informatization acceptance scores compared to baseline ($P>0.05$).

Conclusion: From the perspectives of chronic disease knowledge awareness, self-management attitude, and informatization acceptance, the intervention group showed significantly greater improvement than the control group. From the perspectives of self-efficacy and medication adherence, both groups improved post-intervention, with the intervention group showing more pronounced effects. The comprehensive findings indicate that individualized health education delivered through an informatized knowledge base model contributes to improved health literacy among chronic disease patients.

Full Text

Preamble

Special Research on Multimorbidity in Chronic Diseases

Effectiveness of Individualized Health Education Interventions on Middle-Aged and Elderly Patients with Chronic Diseases in the Community: A Cluster Randomized Controlled Trial

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Abstract

Background: The high incidence of chronic diseases is associated with inadequate knowledge of health and disease risks. Nationally, traditional health education methods remain widespread in community health services. Primary care physicians often provide health education in a singular form with non-specific content, while community residents generally show low enthusiasm for participation. The quality and effectiveness of health education for chronic disease patients require improvement.

Objective: To explore the effectiveness of individualized health education interventions generated through an information-based knowledge base model on middle-aged and elderly patients with chronic diseases in the community, providing reference for strengthening community chronic disease management.

Methods: In 2021, 7,390 patients aged 50-70 years with four chronic diseases (hypertension, diabetes, coronary heart disease, and stroke) were selected from Beijing Dongcheng District Community Health Service Center for a one-year cluster randomized controlled trial. The control group received routine chronic disease follow-up management (maintaining existing basic public health services for chronic diseases). The intervention group additionally received individualized health education programs generated through an information-based knowledge base model, including health education prescription guidance and individualized health management, with follow-up and interventions conducted every 3 months for 12 months. An endpoint survey was conducted one year after enrollment. This study primarily analyzed differences between baseline and endpoint data between groups in terms of “chronic disease knowledge awareness, self-management attitudes, self-efficacy, medication adherence, and acceptance of health information technology.”

Results: A total of 7,390 patients with the four chronic diseases were included, with 3,673 in the intervention group and 3,717 in the control group. No significant differences were found between groups in age distribution, gender, education level, or employment status ($P>0.05$). However, medical insurance type differed significantly between groups ($P<0.05$). After intervention,

the intervention group showed higher correct awareness rates for overall disease knowledge, basic chronic disease knowledge, diabetes knowledge, coronary heart disease knowledge, and stroke knowledge compared to pre-intervention ($P < 0.05$), while hypertension knowledge awareness showed no significant difference ($P > 0.05$). In the control group, no significant differences were found pre- and post-intervention in overall disease knowledge, basic chronic disease knowledge, hypertension knowledge, diabetes knowledge, or coronary heart disease knowledge ($P > 0.05$), while stroke knowledge awareness was lower post-intervention ($P < 0.05$). The intervention group scored higher than the control group post-intervention in self-management attitude questionnaire, self-efficacy questionnaire, medication adherence questionnaire, and health information acceptance questionnaire scores ($P < 0.05$). Within-group comparisons showed the intervention group's scores increased significantly post-intervention for all measures ($P < 0.05$). The control group showed significant improvements only in self-efficacy and medication adherence questionnaires ($P < 0.05$), with no significant changes in self-management attitude or health information acceptance questionnaires ($P > 0.05$).

Conclusion: The intervention group showed significantly greater improvement than the control group in chronic disease knowledge awareness, self-management attitudes, and health information acceptance. Both groups improved in self-efficacy and medication adherence, with more pronounced effects in the intervention group. The findings indicate that individualized health education through an information-based knowledge base model helps improve health literacy among chronic disease patients.

Key words: Chronic disease; Health education; Knowledge base model; Health services; Effect appraisal; Cluster-randomized control trials

1. Introduction

Chronic non-communicable diseases (NCDs) seriously threaten residents' health in China¹. Among the top ten global causes of death, chronic diseases account for seven², and NCDs cause 88.5% of deaths in Chinese residents³. With increasingly prominent population aging, multimorbidity is growing⁴. The prevalence of chronic disease multimorbidity is high among middle-aged and elderly populations in China, with studies showing that the incidence of 11 common chronic diseases reaches 61.9% among those over 50, particularly in impoverished areas⁵. Recent research indicates that chronic disease prevention and treatment in middle-aged and elderly populations requires focused attention⁶, emphasizing strengthened regional health management and improved primary-level disease prevention and treatment capabilities⁷.

As chronic disease prevention and control involves both disease and social characteristics⁸, comprehensive prevention and treatment strategies must strengthen patients' self-management capabilities alongside medication treatment. Numer-

ous domestic and international studies have verified that health education models strengthening health beliefs and self-efficacy have critical impacts and produce good results in patients with common chronic diseases such as hypertension⁹⁻¹⁰, diabetes¹¹, cardiovascular disease¹², and stroke¹³. This demonstrates that primary-level chronic disease prevention and control cannot focus solely on medication treatment; another key aspect is how to better implement comprehensive management. In summary, this study validates the effectiveness of a knowledge base model-based health education approach¹⁴ for improving health literacy among chronic disease patients, providing reference for promoting comprehensive management of chronic disease populations in community settings.

1.1 Study Subjects

This study selected 7,390 patients aged 50-70 years with four chronic diseases (hypertension, diabetes, coronary heart disease, and stroke) from Beijing Dongcheng District Community Health Service Center in 2021 for a one-year cluster randomized controlled trial. The four chronic diseases were selected based on prevalence statistics from Dongcheng District's health management system and their representativeness as typical chronic conditions.

Inclusion criteria: (1) Community permanent residents with established health records; (2) Age 50-70 years; (3) At least one confirmed diagnosis among the four chronic diseases; (4) Informed consent and ability to cooperate with health education and follow-up.

Exclusion criteria: (1) Unable to attend follow-up due to work/life reasons; (2) Mental status abnormalities or other serious diseases preventing normal health education; (3) Non-cooperation or unwillingness to participate.

1.2 Sampling Method and Sample Size

This study employed cluster random sampling and grouping principles. All 54 community health service centers in Dongcheng District were numbered and randomly divided into control and intervention groups using random number methods, with six communities randomly selected. Sample size calculation: With an effective error rate not exceeding 10% and 95% confidence level, the cluster sampling formula was used: $N = Z^2 / \alpha \times P(1-P) / \delta^2$, where $\alpha = 0.05$, $Z / 2 = 1.96$, $P = 0.051$ (minimum disease prevalence based on previous surveys), and $\delta = 0.1\pi$ (allowable error range determined through literature review and expert discussion). Calculation yielded $N = 7,145$. Accounting for a 2% non-response rate, the minimum sample size was $7,145 / 0.98 = 7,291$.

1.3 Research Methods

The control group received routine chronic disease follow-up management strategies (maintaining existing basic public health services for chronic diseases). The intervention group additionally received individualized health education programs generated through an information-based knowledge base model, including

health education prescription guidance and individualized health management, with follow-up and interventions conducted every 3 months for 12 months. An endpoint survey was conducted one year after enrollment. This study primarily analyzed differences between baseline and endpoint data between groups in terms of “chronic disease knowledge awareness, self-management attitudes, self-efficacy, medication adherence, and health information acceptance.”

1.4 Intervention Methods and Process

Based on primary care physicians’ patterns of providing diagnosis and health services to chronic disease patients, this study applied a health education prescription knowledge base model to assist community general practice health education. The specific process is shown in Figure 2 [Figure 2: see original paper]. The model generated health education guidance from eight aspects: nutrition and diet, scientific exercise, psychological stress reduction, tobacco and alcohol control, traditional Chinese medicine health preservation, medication reminders, disease care, and rehabilitation management. All eight categories were completed through the information system used by physicians daily. The knowledge base model application was integrated into the physician workstation. After completing medication prescriptions and medical orders (or during follow-up), physicians could instantly generate individualized health education guidance plans. Physicians could select more suitable knowledge dissemination methods: (1) push digital plans to patients’ mobile devices; or (2) print paper reports on-site. This further promoted the effectiveness and accessibility of health education knowledge delivery, ensuring intervention group patients had sufficient prerequisites for improving health education effectiveness.

1.5 Questionnaire Design and Survey

Questionnaires were primarily self-designed and administered during patient visits for medication, routine follow-up, or physical examinations. Content included: basic patient information, sociodemographics, disease status, chronic disease knowledge awareness, self-management attitude questionnaire, self-efficacy questionnaire, medication adherence questionnaire, and health information acceptance questionnaire. The “knowledge awareness” section combined behavioral habit characteristics of chronic disease populations as basic questions, with 1-3 knowledge points for each disease selected through consultation with clinical experts. Self-management attitude, self-efficacy, medication adherence, and health information acceptance questionnaires partially referenced relevant studies^{15–16}, with additional items designed based on this study’s characteristics and clinical expert consultation, following the Likert five-point scale structure.

1.6 Reliability and Validity

Since reliability analysis generally only applies to ordinal scales measuring magnitude, unordered scales and single/multiple-choice items were excluded before

reliability testing: (1) basic information, sociodemographics, and disease knowledge questionnaires; (2) single-choice and unordered items in medication adherence and health information acceptance questionnaires. Reliability analysis results are shown in Table 1. Cronbach's α coefficient above 0.7 indicates good internal consistency. The results demonstrate that the scales used in this study had good reliability.

Table 1 Cronbach Coefficient Analysis Results

Scale	Cronbach's α
Self-management Attitude Questionnaire	0.500
Self-efficacy Questionnaire	<0.05
Health Information Acceptance Questionnaire	<0.05

Validity analysis was conducted on scales passing reliability testing, with results shown in Table 2. When $KMO > 0.6$ and $P < 0.05$, data are suitable for exploratory factor analysis. Since the health information acceptance questionnaire had only 2 gradient-valued items, its KMO value indicated it was unsuitable for exploratory factor analysis. Items Q5 in the self-management attitude questionnaire and Q2 in the self-efficacy questionnaire showed factor loadings > 0.5 on two dimensions simultaneously, indicating low specificity and effectiveness. These items' weights were reduced in results processing. Overall, 10 of 14 items showed good validity.

Table 2 KMO and Bartlett Tests and Exploratory Factor Tests

Scale	KMO Value	P Value	Multi-dimensional Loading Factors
Self-management Attitude Questionnaire	0.500	<0.05	
Self-efficacy Questionnaire	<0.05	<0.05	
Health Information Acceptance Questionnaire	<0.05		

1.7 Statistical Methods

Data were analyzed using SPSS 24.0 and Excel. Baseline survey data were analyzed using descriptive statistics. Count data were expressed as relative numbers and analyzed using χ^2 tests. Ranked data were compared using rank-sum tests. Continuous normally distributed data were expressed as $(\bar{x} \pm s)$, with between-group comparisons using independent t-tests and within-group pre-post comparisons using paired t-tests. Skewed data were analyzed using nonparametric Wilcoxon rank-sum tests. After trial completion and endpoint data collection, the study compared changes in knowledge awareness, self-management attitudes, self-efficacy, medication adherence, and health information acceptance between groups.

1.8 Questionnaire Scoring Method

Chronic disease knowledge awareness: Each knowledge item was scored as correct or incorrect, with 14 total items (5 basic health questions, 9 disease-specific questions). Correct rate = (correct items/total items) \times 100%.

Self-management attitude and self-efficacy questionnaires used identical option structures, scored as: “Very important/Definitely can = 5 points,” “Important/Probably can = 4 points,” “General/Basically can = 3 points,” “Not important/Cannot = 2 points,” “Very unimportant/Definitely cannot = 1 point.” Score range: 6-30 points, with 25-30 defined as “good,” 19-24 as “average,” 13-18 as “insufficient,” and 6-12 as “deficient.”

Medication adherence and health information acceptance questionnaires primarily used “yes/no” options, with good habits/acceptance = 1 point and poor habits/resistance = 0 point. Gradient options were scored as: “Always forget/Strongly disagree = 0,” “Often forget/Disagree = 1,” “Often forget/Neutral = 2,” “Rarely forget/Agree = 3,” “Never forget/Strongly agree = 4.” Medication adherence score range: 0-11 points, with ≥ 9 defined as “good adherence,” 5-8 as “average,” and ≤ 4 as “poor.” Health information acceptance score range: 0-12 points, with ≥ 9 as “positive,” 7-9 as “average,” 4-6 as “insufficient,” and ≤ 3 as “lacking.”

2. Results

2.1 Comparison of Sociodemographic Factors Between Groups

A total of 7,390 patients with four chronic diseases aged 50-70 were included, with 3,673 in the intervention group and 3,717 in the control group. No significant differences were found between groups in age distribution, gender, education level, or employment status ($P > 0.05$). Medical insurance type differed significantly between groups ($P < 0.05$), as shown in Table 3.

Table 3 Comparison of Sociodemographic Factors Between Groups [n (%)]

Factor	Control Group (n=3,717)	Intervention Group (n=3,673)
Age		
50-55 years	271 (7.29)	284 (7.73)
56-60 years	770 (20.72)	718 (19.55)
61-65 years	1,171 (31.50)	1,175 (31.99)
66-70 years	1,505 (40.49)	1,496 (40.73)
Gender		
Male	1,660 (44.66)	1,646 (44.81)
Female	2,057 (55.34)	2,027 (55.19)
Education		
Primary school or below	74 (1.99)	67 (1.82)

Factor	Control Group (n=3,717)	Intervention Group (n=3,673)
High school/technical school	1,087 (29.24)	1,116 (30.38)
College/undergraduate	1,641 (44.15)	1,591 (43.32)
Master's or above	886 (23.84)	865 (23.55)
Employment		
Employed	29 (0.78)	34 (0.93)
Medical Insurance		
Urban employee insurance	3,231 (86.92)	3,228 (87.88)
Urban resident insurance	410 (11.03)	390 (10.62)
Rural cooperative medical	76 (2.04)	55 (1.50)

2.2 Disease Distribution Status

Among 7,390 patients, 6,590 had hypertension (89.17%). No significant difference was found in hypertension diagnosis duration between groups ($P>0.05$). Multimorbid patients with hypertension numbered 3,110, accounting for 47.19% of all hypertension patients, with no significant between-group difference in diagnosis duration ($P>0.05$), as shown in Table 4 .

Among all patients, 2,660 had diabetes (35.99%). No significant difference was found in diabetes diagnosis duration between groups ($P>0.05$). Multimorbid patients with diabetes numbered 2,203, accounting for 82.82% of all diabetes patients, with no significant between-group difference in diagnosis duration ($P>0.05$), as shown in Table 5 .

Coronary heart disease affected 1,710 patients (23.14%). No significant difference was found in diagnosis duration between groups ($P>0.05$). Multimorbid patients with coronary heart disease numbered 1,566, accounting for 91.58% of all coronary heart disease patients, with no significant between-group difference in diagnosis duration ($P>0.05$), as shown in Table 6 .

Stroke affected 588 patients (7.96%). No significant difference was found in stroke diagnosis duration between groups ($P>0.05$). Multimorbid patients with stroke numbered 557, accounting for 94.73% of all stroke patients, with no significant between-group difference in diagnosis duration ($P>0.05$), as shown in Table 7 .

2.3 Comparison of Chronic Disease Knowledge Awareness Before and After Intervention

Between-group comparison: Before intervention, no significant differences were found between groups in overall disease knowledge, basic chronic disease knowledge, hypertension knowledge, diabetes knowledge, coronary heart disease knowledge, or stroke knowledge awareness ($P>0.05$). After intervention, the intervention group showed significantly higher correct awareness rates than the control group in overall disease knowledge, basic chronic disease knowledge,

diabetes knowledge, coronary heart disease knowledge, and stroke knowledge ($P < 0.05$), but not in hypertension knowledge ($P > 0.05$), as shown in Table 8 .

Within-group comparison: In the control group, no significant differences were found pre- and post-intervention in overall disease knowledge, basic chronic disease knowledge, hypertension knowledge, diabetes knowledge, or coronary heart disease knowledge ($P > 0.05$), while stroke knowledge awareness was significantly lower post-intervention ($P < 0.05$). In the intervention group, post-intervention correct awareness rates were significantly higher than pre-intervention for overall disease knowledge, basic chronic disease knowledge, diabetes knowledge, coronary heart disease knowledge, and stroke knowledge ($P < 0.05$), but not for hypertension knowledge ($P > 0.05$), as shown in Table 8 .

Table 8 Comparison of Chronic Disease Knowledge Awareness Accuracy Before and After Intervention ($\bar{x} \pm s$, %)

Knowledge Domain	Control Group (n=3,717)		Intervention Group (n=3,673)	
	Baseline	Endpoint	Baseline	Endpoint
Overall disease knowledge	0.67 \pm 0.19	0.66 \pm 0.21	0.71 \pm 0.18 ^a	0.67 \pm 0.24
			<i>Basic chronic disease knowledge</i> 0.67 \pm 0.20	

$P < 0.001$ vs. baseline

2.4 Self-Management Attitude Questionnaire

No significant between-group difference was found in self-management attitude questionnaire scores before intervention ($P > 0.05$). After intervention, the intervention group scored significantly higher than the control group ($P < 0.05$). Within-group comparison showed no significant difference in the control group pre- and post-intervention ($P > 0.05$), while the intervention group showed significant improvement ($P < 0.05$), as shown in Table 9 .

Table 9 Comparison of Self-Management Attitude Questionnaire Scores Before and After Intervention ($\bar{x} \pm s$, points)

Group	n	Baseline	Endpoint	Paired t-value
Control	3,717	26.47 \pm 3.79	26.41 \pm 3.66	<i>Intervention</i> 3,673 26.55 \pm 3.74 26.93 \pm 3.38

2.5 Self-Efficacy Questionnaire

No significant between-group difference was found in self-efficacy questionnaire scores before intervention ($P > 0.05$). After intervention, the intervention group scored significantly higher than the control group ($P < 0.05$). Within-group comparison showed both groups improved significantly post-intervention ($P < 0.05$), as shown in Table 10 .

Table 10 Comparison of Self-Efficacy Questionnaire Scores Before and After Intervention ($\bar{x} \pm s$, points)

Group	n	Baseline	Endpoint	Paired t-value
Control	3,717	25.66 \pm 4.31	26.16 \pm 4.00	0.001
Intervention	3,673	25.70 \pm 4.00	26.58 \pm 3.38	<

2.6 Medication Adherence Questionnaire

No significant between-group difference was found in medication adherence questionnaire scores before intervention ($P > 0.05$). After intervention, the intervention group scored significantly higher than the control group ($P < 0.05$). Within-group comparison showed both groups improved significantly post-intervention ($P < 0.05$), as shown in Table 11 .

Table 11 Comparison of Medication Adherence Questionnaire Scores Before and After Intervention ($\bar{x} \pm s$, points)

Group	n	Baseline	Endpoint	Paired t-value
Control	3,717	6.97 \pm 1.98	7.14 \pm 1.82	0.001
Intervention	3,673	7.05 \pm 1.95	7.24 \pm 1.64	<

2.7 Health Information Acceptance Questionnaire

No significant between-group difference was found in health information acceptance questionnaire scores before intervention ($P > 0.05$). After intervention, the intervention group scored significantly higher than the control group ($P < 0.05$). Within-group comparison showed no significant difference in the control group ($P > 0.05$), while the intervention group improved significantly ($P < 0.05$), as shown in Table 12 .

Table 12 Comparison of Health Information Acceptance Questionnaire Scores Before and After Intervention ($\bar{x} \pm s$, %)

Group	n	Baseline	Endpoint	Paired t-value
Control	3,717	6.40 \pm 3.43	6.33 \pm 3.43	0.001
Intervention	3,673	6.33 \pm 3.32	7.26 \pm 2.68	<

3. Discussion

3.1 Sociodemographic Analysis

The significant difference in medical insurance type between groups indicates occupational differences in community residents. Since “employee/resident ratio” is not a direct factor affecting health education intervention effectiveness

and the difference was relatively small (2.46%), comprehensive analysis suggests the two groups remained comparable overall.

3.2 Disease Distribution Analysis

Analysis of disease duration across the four chronic diseases showed: (1) Comparable disease duration distribution structures between groups; (2) Longer disease duration correlated with higher multimorbidity rates; (3) High proportions of coronary heart disease and stroke patients had comorbidities; (4) Most patients were concentrated in three duration stages: 2-5 years, 6-10 years, and 11-20 years. These results validate the accuracy of chronic disease diagnosis duration data.

3.3 Chronic Disease Knowledge Awareness Analysis

The intervention group's overall disease knowledge awareness increased by 4% post-intervention, with improved awareness for all diseases except hypertension. This may be due to hypertension's ubiquity reducing patients' sensitivity to related knowledge points, resulting in minimal cognitive change. The control group showed significantly decreased stroke knowledge awareness and no significant changes for other diseases, likely because the control group lacked precise health knowledge reminders, and stroke patients' disease characteristics led to insufficient attention to the endpoint survey.

3.4 Self-Management Attitude/Self-Efficacy Analysis

In self-management attitudes, the intervention group showed significant improvement post-intervention, with average scores increasing by 0.375 points, while the control group showed no significant change. Both groups improved in self-efficacy, with the intervention and control groups increasing by 0.886 and 0.497 points respectively, with more pronounced improvement in the intervention group. This demonstrates that individualized health education positively impacts patients' self-management attitudes and self-efficacy. Properly designed health education prescriptions can significantly improve patients' understanding and execution, promoting functional health literacy (FHL).

3.5 Medication Adherence/Health Information Acceptance Analysis

Both groups improved in medication adherence, with the intervention and control groups increasing by 0.19 and 0.172 points respectively. The intervention group showed slightly greater improvement, likely because chronic patients' long-established medication habits and cognition are difficult to fundamentally change in the short term. In health information tool acceptance, the intervention group increased by 0.933 points, while the control group showed no significant change, demonstrating that information-based health education interventions effectively improve patients' acceptance of health information tools.

3.6 Study Value and Limitations

Study Value: This community-based study validated the effectiveness of using a knowledge base model to generate individualized health education programs for middle-aged and elderly chronic disease patients. Results demonstrate significant improvements in disease knowledge awareness, self-management attitudes, self-efficacy, and health information tool acceptance compared to conventional approaches. The information-based health education prescription knowledge base model has practical application value in community health services, providing a new approach to enhance community health service capacity.

Study Limitations: (1) Insufficient health indicator recording: The original plan for follow-up every 3 months to record health indicator changes was difficult to implement due to physicians' multiple pandemic prevention tasks during the study period. (2) Limited representativeness: The study population of ordinary residents in Beijing's Dongcheng District only represents health literacy changes in a first-tier city's community population and lacks universal applicability. Future research should address these issues.

Individualized health education using an information-based knowledge base model can improve health literacy among chronic disease patients, consistent with findings from similar studies¹⁷.

Author Contributions: Li Xiaoze conducted data analysis and manuscript writing; Sun Guoqiang provided revision suggestions and guidance; Shen Qiang and Song Yan implemented the study and collected data; Wang Hufeng conceptualized the article and supervised content.

Conflict of Interest: None declared.

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