

Analysis of the Effect of Family-Centered Empowerment Model (FCEM) Health Education Through WeChat on Medication Compliance and Blood Pressure of Elderly Hypertensive Patients in Rural Areas

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Abstract: *Objective:* To validate the effectiveness of a Family-Centered Empowerment Model (FCEM) health education through WeChat on medication compliance and blood pressure among elderly hypertensive patients in rural areas. *Methods:* One hundred and two rural elderly hypertensive patients aged 65–80 years were selected and randomly divided into an experimental and control group of 51 each. The control group implemented conventional health education, and the experimental group implemented FCEM health education through WeChat platform for 4 consecutive weeks. The Therapeutic Adherence Scale for Hypertensive Patients (TASHP) scores and blood pressure measurements were compared between and within the two groups. *Results:* After the intervention, there were significant differences in medication compliance and blood pressure between the two groups ($P < 0.001$). In the control group, before and after the intervention, there was a significant difference in medication compliance ($P < 0.001$), but no significant difference in blood pressure ($P > 0.05$). In the experimental group, there were significant differences in medication compliance and blood pressure before and after the intervention ($P < 0.001$). *Conclusion:* The FCEM health education through an online social platform significantly improved medication compliance and led to effective blood pressure control in rural elderly hypertensive patients. Therefore, as an effective, safe, and economical model, it is also necessary to explore its effectiveness in improving health problems in other chronic diseases and other age groups.

Keywords: Family Support; Empowerment; Hypertension; Elderly; Medication Compliance

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1. Introduction

Hypertension has become a growing global health problem as the prevalence and absolute burden of hypertension increases. Related studies showed that by the end of 2021, 13.5% of China's population was over 65 years of age, and more than 50% of them suffered from hypertension^[1]. The rational use of anti-hypertensive

medication can normalize blood pressure in most hypertensive patients. As one of the important measures to treat and control hypertension in the elderly at home, the effectiveness of the medication depends largely on the patient's compliance with the medication [2,3].

In 2010, the American Society of Hypertension established medication compliance as an important indicator for the management of hypertensive patients [4]. Medication compliance can be summarized as the degree to which the patient's behavior in taking medications is consistent with the physician's orders. It can be summarized as the patient's compliance with the prescriptions and recommendations for the timing, dosage, and frequency of medication throughout medication administration [5]. A final report on medication adherence in Europe in 2012 stated that it should also include the adjustment or discontinuation of medication during the process [6]. Medication non-compliance is very common among hypertensive patients worldwide, given their high prevalence and mortality rates [7]. Elderly hypertensive patients may be more prone to poor medication compliance due to the physiological characteristics of aging such as memory loss and lack of knowledge. Good medication compliance can help to lower and control blood pressure in older patients with hypertension. Knowledge about the disease as a direct cause of medication compliance in hypertensive patients can be improved through health education by healthcare workers [8]. Reasonable and effective health education can increase the knowledge of elderly hypertensive patients in rural areas of China and is of great significance in improving the patient's medication compliance.

The Family-Centered Empowerment Model (FCEM) was first proposed by Dr. Ahlani in 2002. It is based on the four stages of the model: identifying perceived threats, increasing self-efficacy, increasing self-esteem, and evaluating processes and outcomes [9]. The FCEM has been widely used in disease management with significant results. Ahani *et al.* demonstrated the applicability of FCEM as a simple and effective model for families with chronic disease patients [10]. Shoghi *et al.* suggested that nurses applying this model to empower parents of children with cancer and reduce their burden of care had a significant effect [11].

In China, there are few studies on the implementation of health education in the four phases of the FCEM. Health education for elderly hypertensive patients is mainly led by healthcare professionals and lacks a long-term, well-defined, standardized approach that also emphasizes support from the patient's families. Meanwhile, the low rate of hypertension control and poor medication adherence among the elderly remains a pressing issue that needs to be addressed, especially in rural areas. Considering their limited access to health promotion and telehealth facilities, information, emotional and other support from family members can help promote the patient's health. This study aimed to implement a health education program with the FCEM to improve medication compliance and blood pressure among elderly hypertensive patients in a rural community in China with the help of the WeChat platform.

2. Materials and methods

2.1. General information

One hundred and two rural elderly hypertensive patients aged between 65 and 80 years were selected in a rural area of Shandong, China, and randomly divided into two groups, a control group and an experimental group of 51 subjects each. From November 2023 to January 2024, conventional routine health education was implemented in the control group, and FCEM health education was implemented in the experimental group via the WeChat platform for 4 consecutive weeks. A total of 101 data were collected from one participant in the experimental group due to dropout, 51 in the control group, and 50 in the experimental group. The control group consisted of 22 males and 29 females, with a median age of 71 years. The majority of patients had elementary school education (27, 52.9%). The early family income below 30,000 RMB was 24 (47.1%) people.

The average disease duration was 16.18 ± 5.84 years. The experimental group consisted of 24 males and 26 females with a median age of 71 years. Elementary school education was predominant (22, 44.0%). The early family income of 30,000 RMB–60,000 RMB was 25 (50.0%) people. The average disease duration was 14.52 ± 5.90 years. There were no significant differences between the demographic characteristics of the participants in both groups before the intervention ($P > 0.05$).

Inclusion criteria: (1) Patients meet the diagnostic criteria for hypertension in which the systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg on 3 non-same day measurements without the use of anti-hypertensive medication (Chinese guidelines for the management of hypertension in the elderly 2023); (2) most recent blood pressure measurement shows SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg; (3) aged between 65–80; (4) able to communicate properly and consented; (5) taking 1–2 types of blood pressure control medications according to the doctor’s prescription; (6) presence of a family caregiver who is ≥ 18 years of age; (7) proficient in using the WeChat social platform on a smartphone.

Exclusion criteria: (1) Patients who are taking their medication on time and whose blood pressure is well controlled and within normal limits; (2) patients with questionnaire scores higher than 95; (3) other serious medical conditions requiring prolonged bed rest; (4) mental impairments; (5) patients who were uncooperative or withdrew from the study.

2.2. Methods

The control group received the conventional regular follow-up health education. Blood pressure was recorded according to the measurement of the village health clinic and instructions on medication were given to the patients. The experimental group conducted health education according to the four phases of FCEM.

(1) Identifying perceived threats

In the first week, the researcher held an online meeting. The researcher used the meeting to explain the study and build trust with the patients and their caregivers. The elderly hypertensive patients and their caregivers were introduced to the physiology of hypertension, symptoms, complications, medications, diet, activity, exercise, and other related topics through the hypertensive patient’s booklet. The family caregivers were asked to regularly educate the elderly and remind them daily to take their medications. This phase expects to build familiarity and trust between the researcher, patients, and their families, and to increase their perceived severity and sensitivity of the disease.

(2) Increasing self-efficacy

In the second week, the researcher conducted the second online meeting to answer questions from the patients from the previous week. The researcher attempted to indirectly lead discussions among patients or family caregivers to guide them in addressing their questions and enriching their sense of self-efficacy. Education on blood pressure measurement was conducted through a PowerPoint presentation. The acquisition of this skill also increased the self-efficacy of patients and their families. Patients and caregivers were asked to practice and repeat these skills until proficient. The caregiver was asked to help the patient demonstrate how to properly measure blood pressure, and the patient in turn demonstrated to the caregiver. The family caregiver still reminded the patient to take their medications daily.

(3) Increasing self-esteem

In the third week, the researcher conducted the third online meeting to answer questions from the patient from the previous week. During this week, family caregivers were asked to be proactive, and encouraging, and provide daily medication reminders to patients. The caregivers were also asked to

transfer what they have learned in the last two phases to the patient and other family members in a way that is easy to understand.

By the end of the third week, the researcher organized the fourth online meeting to summarize what the patients and their families have learned through the educational materials and asked questions. Model patients were selected to share their knowledge and experience. Questions by patients and their caregivers can also ask questions that were answered and summarized by the researcher and uploaded onto the WeChat group. This phase expects to improve self-esteem through educational contributions and to enable positive emotional interactions between patients and caregivers.

(4) Evaluating processes and outcomes

In the fourth week, the researcher summarized and concluded the relevant assessments from the previous phases. The researcher also guided the patient and caregiver to conduct a self-assessment and post relevant insights. This phase expects to be able to self-assess and publish relevant insights at every stage and eventually in patients and family caregivers.

2.3. Research instruments

A two-part self-administered questionnaires were used that contained two parts: 1) patient profile, and 2) the Therapeutic Adherence Scale for Hypertensive Patients (TASHP). The first part of the questionnaire was the basic patient profile including general demographic characteristics (age, gender, education level, and income level), course of hypertension, the type of medication taken, whether the medication is taken regularly, and the patient's knowledge about hypertension. The TASHP was first developed by Tang *et al.* In 2011 and is based on Orem's theory of self-care and consisted of four dimensions: medication compliance, poor medication-taking behavior, daily life management behavior, and alcohol and tobacco management behavior^[12]. The four dimensions contained a total of 25 items. They were assigned 1–5 points respectively, and the negative questions were scored in reverse, for a total of 25–125 points. The total Cronbach's α coefficient for the TASHP was 0.862. The TASHP was used to assess compliance to hypertension treatment in rural elderly hypertensive patients before and 4 weeks after the intervention, with higher scores indicating better compliance. The electric sphygmomanometer and a blood pressure recording form were used to measure and record blood pressure values (SBP, DBP) before and after the intervention.

2.4. Statistical analysis

The data collected from the questionnaires was coded and sorted using Microsoft Excel software and statistically processed using the SPSS 23.0 statistical software. Demographic characteristics questionnaire data were expressed frequency, percentage, mean \pm standard deviation, and compared and analyzed using the Mann-Whitney u test, chi-squared (χ^2) test, and independent *t*-test. TASHP data and measurement data were described as means \pm standard deviation and analyzed by independent samples *t*-test and paired samples *t*-test. Results were considered statistically significant at $P < 0.05$.

3. Result

3.1. Demographic variables

Table 1 shows the baseline data of the participants including age, sex, education level, yearly family income, and disease duration of the study participants through descriptive statistics. The comparison of demographic characteristics of the two groups before the intervention was not significantly different ($P > 0.05$).

Table 1. Demographic characteristics data of the participants in the two groups (mean ± standard deviation, [*n* (%)])

Variable	Control group	Experimental group	<i>P</i>
Age	71 (68,76)	71 (67.75,75.25)	0.619 ^a
Sex			0.624 ^b
Male	22 (43.1)	24 (48.0)	
Female	29 (56.9)	26 (52.0)	
Education level			0.204 ^a
Not attending school	17 (33.3)	14 (28.0)	
Elementary school	27 (52.9)	22 (44.0)	
Middle school	4 (7.8)	10 (20.0)	
High school	3 (5.9)	4 (8.0)	
Undergraduate and above	0 (0.0)	0 (0.0)	
Yearly family income (RMB)			0.837 ^a
< 30,000	24 (47.1)	23 (46.0)	
30,000–60,000	22 (43.1)	25 (50.0)	
60,000–100,000	5 (9.8)	2 (4.0)	
≥100,000	0 (0.0)	0 (0.0)	
Disease duration (years)	16.18 ± 5.84	14.52 ± 5.90	0.159 ^c

^{Mann}-Whitney U test, ^bChi-squared, ^cIndependent *t*-test, *n* = 101

3.2. The differences in medication compliance and blood pressure between the two groups

As shown in **Table 2**, before the intervention, there were no significant differences in the medication compliance scores and blood pressure values between the two groups ($P > 0.05$). After the intervention, the medication compliance scores of the experimental group were higher than those of the control group, and the blood pressure values were lower than the control group ($P < 0.001$).

Table 2. Differences in medication compliance and blood pressure between the two groups (mean ± standard deviation)

Group	Medication compliance scores (TASHP)		SBP		DBP	
	Before	After	Before	After	Before	After
Control	81.71 ± 6.39	88.29 ± 5.48	151.08 ± 7.59	148.59 ± 10.53	86.25 ± 11.10	83.84 ± 8.28
Experimental	80.98 ± 6.94	101.78 ± 5.22	153.50 ± 8.25	132.64 ± 11.50	83.66 ± 7.36	77.04 ± 6.69
<i>t</i>	0.547	-12.654	-1.536	7.274	1.387	4.534
<i>P</i>	0.586	< 0.001	0.128	< 0.001	0.169	< 0.001

3.3. The differences in medication compliance and blood pressure within the two groups before and after the intervention

As shown in **Table 3**, there were significant differences in medication compliance scores before and after the intervention in both groups ($P < 0.001$). There were no significant differences in the systolic and diastolic blood pressure of participants before and after conventional routine health education in the control group ($P > 0.05$). In the experimental group, there were significant differences in both systolic and diastolic blood pressure of the

participants before and after FCEM online health education ($P < 0.001$).

Table 3. Differences in medication compliance and blood pressure within the two groups before and after the intervention (mean \pm standard deviation)

Time	Medication compliance scores (TASHP)		SBP		DBP	
	Control	Experimental	Control	Experimental	Control	Experimental
Before	81.71 \pm 6.39	80.98 \pm 6.94	151.08 \pm 7.59	153.50 \pm 8.25	86.25 \pm 11.10	83.66 \pm 7.36
After	88.29 \pm 5.48	101.78 \pm 5.22	148.59 \pm 10.53	132.64 \pm 11.50	83.84 \pm 8.28	77.04 \pm 6.69
<i>t</i>	-11.760	-37.950	1.806	13.761	1.052	5.708
<i>P</i>	< 0.001	< 0.001	0.077	< 0.001	0.139	< 0.001

4. Discussion

This study validated the effects of implementing the FCEM online health education on medication compliance and blood pressure in 101 elderly hypertensive patients in rural Shandong, China. As seen in **Table 2**, the results of this study indicated that there were significant differences in medication compliance scores and blood pressure measurements between both groups after the intervention ($P < 0.001$). This demonstrated that FCEM Health Education through WeChat significantly increased medication compliance and improved poor blood pressure control in rural elderly hypertensive patients. Consistent with the results of this study, Song *et al.* demonstrated that health education and management based on the WeChat platform helped elderly hypertensive patients adhere to their anti-hypertensive medications rationally^[13]. Her study elaborated that nurses promoted the patient's hypertension-related disease knowledge and nursing skills through health education interventions. Meanwhile, in the global background of the epidemic, health education based on social mobile platforms such as WeChat is a more convenient, effective, and feasible way.

Kurnia *et al.* further proved that the accumulation of positive effects of health education on the knowledge of hypertensive patients enhanced their confidence in the disease, formed healthy beliefs, and then motivated them to change their attitudes toward the management of their disease^[14]. In this study's theoretical framework, known as the KAP model, the acceptance of knowledge as the basic and attitude change as the motivation of elderly hypertensive patients are important factors that influence their behavior to actively participate in the management of their disease, develop a good lifestyle, comply with the doctor's instruction for medication, control their blood pressure, delay or prevent the occurrence of complications, and promote their health. However, conventional health education is often in a single form, with nurses unilaterally outputting disease knowledge to elderly hypertensive patients while ignoring the actual acceptance and feedback from patients. Such health education is often difficult to mobilize the patient's subjective initiative and it is difficult to form positive health beliefs and attitudes. Hence, patients cannot effectively change their long-term adverse behaviors to achieve the purpose of enhancing knowledge, improving compliance with hypertension treatment, and lowering blood pressure^[15].

In contrast to the above studies related to conventional health education subjects, the participants in this study were rural elderly hypertensive patients. This study's WeChat-based FCEM health education incorporated family member support and empowerment based on conventional health education. Rural elderly hypertensive patients have a lower average education level and a limited acceptance of knowledge, which, combined with the decline in physiological functioning, memory loss, and the effects of the disease due to aging, tends to show a greater dependence on their family. Family members participated in managing the patient's diet, medication,

and related disease management. Family members also reminded and supervised the patient's medication, which to a certain extent makes up for the shortcomings of the lower education level of elderly hypertensive patients. Relevant studies have also shown that including family members' support in improving the health status of hypertensive patients helped improve the quality of care and treatment, and demonstrated important clinical significance in improving their adherence to medication and alleviating unhealthy lifestyles^[16].

The research intervention in this study further took into account the importance of family and also conducted a holistic family-based empowerment. Unlike other studies, the empowerment of this study was for the family as a whole and not only for the hypertensive patients. Incorporating the role of the family and empowering the family caregivers and patients as a whole, FCEM health education empowers patients and family caregivers to cooperate to improve their knowledge of the disease and help patients develop better health beliefs, attitudes, and behaviors. Additionally, this empowerment helps family members take on the role of caregiver, where they remind, supervise, support, and care for the patient. FCEM was first proposed and applied in Iran by Dr. Ahlani in 2002. Subsequent studies conducted by researchers in different patient populations in Iran including children, women, and patients with chronic diseases have verified the significant changes brought by FCEM. These studies and the present study, although involving different populations, were based on the four phases of FCEM: identifying perceived threats, increasing self-efficacy, increasing self-esteem, and evaluating processes and outcomes.

Hypertension is a major health problem worldwide with no cure. FCEM can provide an effective solution to some of the problems encountered in the treatment process of hypertensive patients. Keshvari *et al.* found that the blood pressure of hypertensive patients in the Lenjan County of Isfahan improved after the implementation of FCEM, which was the first time that FCEM was applied to hypertensive patients^[14]. This was the same population as the present study but the length of intervention and the area where it was conducted were different. Hamedani *et al.* examined the effect of FCEM on the quality of life of hypertensive patients in a province of Iran and administered questionnaires at 1 and 3 months post-intervention. Results showed that the quality of life scores of the patients 1 month after the intervention were optimal^[17]. Mohalli *et al.* found that FCEM increased the knowledge, self-esteem, and self-efficacy of hypertensive patients in healthcare centers in the city of Qaen ($P < 0.05$)^[18].

Data in **Table 3** suggested that although the implementation of conventional routine health education in the control group improved medication compliance in elderly hypertensive patients to a certain extent, the slight change of a smaller increase was not reflected in the further impact on blood pressure over a month. This was in line with the findings of Ozoemena *et al.* who implemented health education on hypertension among hypertension retirees^[19]. Their study found that health education improved the retirees' knowledge of hypertension and medication adherence but there was no significant difference in blood pressure measurements before and after the intervention ($P > 0.05$). This may be because routine health education did not enable participants to develop skills related to blood pressure measurements or because the one-month intervention period may have been too short for routine health education to have a sufficient impact on patients to alter objective blood pressure measurements. Compared with conventional routine health education, FCEM health education improved medication compliance and controlled blood pressure by improving the knowledge of the caregivers of elderly hypertensive patients, increasing the patients' self-confidence in self-management of hypertension, and developing nursing skills and problem-solving abilities related to blood pressure measurement.

FCEM health education is more effective than conventional routine health education in rural elderly hypertensive patients. Considering the current situation of population aging in China and the increasing

prevalence of hypertension and other chronic diseases among the elderly, the rational use of FCEM is a simple, feasible, and economical way to deliver health education to rural elderly hypertensive patients. The insights gained from the fourth stage of FCEM can be used to further help patients address the problems in the next round of FCEM health education. Such a long-term application can establish a virtuous cycle of promoting the patient's health. It is also consistent with the long-term goal of improving the patient's compliance with medication and improving blood pressure to delay and prevent the occurrence of stroke, heart failure, and a series of complications in elderly hypertensive patients.

5. Conclusion

FCEM health education through the WeChat platform significantly improved medication compliance and led to effective blood pressure control in rural elderly hypertensive patients. This intervention helped patients and caregivers gain knowledge about the disease and provided better family support to patients. Through a cascade of four stages, patient attitudes towards treatment and the behaviors of patients and family caregivers can be improved. As hypertension is a chronic disease that cannot be cured completely, appropriate medication compliance and blood pressure management after the intervention may help prevent or delay the occurrence of complications, thus promoting the health of patients, families, communities, and even society. Nonetheless, it is necessary to explore the model's effectiveness in improving health problems in other chronic diseases and other age groups.

Disclosure statement

The authors declare no conflict of interest.

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