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Feasibility of a patient engagement and medication safety management program for older adults suffering cardiovascular disease in community settings

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Abstract

Objectives: To assess the feasibility of a patient engagement and medication safety management (PE-MSM) program on medication errors, self-efficacy for appropriate medication and activation among older patients suffering cardiovascular disease (CVD) in Chinese communities.

Methods: A patient engagement and medication safety management (PE-MSM) program intervention study was performed. Older patients suffering CVD in the intervention group (n = 62) received PE-MSM program, while the control group (n = 58) took a 12-week medication safety education alone.

Results: Compared with the control group, patients having undergone the individualized PE-MSM program achieved lower incidence of medication errors ($P < .001$), and a statistically significant interaction was identified between treatment groups and assessment time points in terms of the total score of self-efficacy for appropriate medication use scale and the number of patients with different activation levels ($P < .001$).

Conclusions: The PE-MSM program is demonstrated to be feasible. Compared with single medication safety education, the PE-MSM program is capable of decreasing the incidence of common medication errors, enhancing the self-efficacy of appropriate medication and the activation of older patients with CVD in a community.

Practice implications: The PE-MSM program is likely to act as a promising medication management model for the routine health care of older patients suffering CVD in communities.

Abbreviations: CVD = cardiovascular disease, MEQ = medication error questionnaire, PAM = patient activation measure, PE-MSM = patient engagement and medication safety management, SEAMS = self-efficacy for appropriate medication use scale.

Keywords: cardiovascular disease, medication management, medication safety, patient engagement

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"I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story."

The authors have no conflicts of interests to disclose.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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1. Introduction

1.1. Background

Cardiovascular diseases (CVDs) have long been a major cause of health loss worldwide.[1] In China, CVDs are considered to primarily cause death, taking up 2 out of 5 deaths. As suggested from Report on CVDs in China 2018, there were overall 290 million CVD patients.[2] As the largest developing country, though China experienced rapid health transitions,[3] the prevalence and mortality rate of CVDs further increased, causing the burden of CVDs on the elderly to increase in China.[4,5]

Medication is critical to prevent and ameliorate older patients suffering CVD in the community.[6] However, existing studies suggested that medication errors were prominent in CVD patients, and the risk of potentially inappropriate medication has been suggested to be high, especially for the older patients; thus, medication safety management of older patients suffering CVD in the community has been difficult to achieve.[7–9] Medication error has been defined as "the failure to achieve a planned action as intended, or the application of a wrong plan to achieve an aim."[10] Patient safety studies stressed that preventable medication errors cause a relevant health problem, since they are the principal causes of adverse events, especially among the older patients.[11,12] Overall, preventable medication errors are attributed to self-medication (a medicine taken by the patient but not prescribed by the doctor), nonadherence (a medication

prescribed by the doctor, instead of being taken by the patient, or the patient failed to comply with the dosage indications or the stipulated schedule), and nonpersistence (medication withdrawal before the stipulated period has elapsed).[13–15] Several studies attempted to eliminate the causes of the most common medication errors and therefore down-regulate their incidence in different medical settings.[12,16] However, the existing studies primarily focused on setting out or expressing the problems, whereas numerous questions remain unanswered, especially in community settings (e.g., how to make patients more proactively engage themselves in the reduction of medication-associated risks and medication safety management).[12,17]

Patient-centeredness refers to a vital aspect of healthcare and quality and safety, and several international safety initiatives highlighted the significance of patient engagement and patient safety.[18,19] Patient engagement refers to the involvement of patients, families, and caregivers in facilitating health care and health care safety.[20] As revealed from existing studies, effective patient engagement about medications can boost medication safety.[17,21] Moreover, as reported by the 70-second World Health Assembly, Medication error primarily causes injury and avoidable injury in the medical and health system, and it is highlighted in facilitating the participation of patients and families in medication safety management.[22] Besides, as proposed by the Chinese Hospital Association, patients should be encouraged to engage in the management of patient safety to boost the safety of the medication.[23] Furthermore, interventions to promote medication safety management remain limited and underexplored.[24,25]

It is noteworthy that most patients suffering from CVD in China receive medication education and management in hospitals only without health professionals in communities to administrate their medication and follow-up. Thus, the burden of medication is increasingly serious for the older patients returning to the community after discharge.[26] Moreover, it is reported that existing intervention studies focused on medication safety of patients in China primarily complied with the hospital background, the community older patients' engagement has been rarely discussed in medication safety research, and the content, form, and effect evaluation of this interventions remain unclear.[27,28] Accordingly, under community health services in China, this study aimed to build the patient engagement and medication safety management (PE-MSM) program that integrates the current situation and factors of medication management of older patients suffering CVD, and verified its feasibility to reduce medication errors and enhance its self-efficacy for appropriate medication and patient activation.

1.2. Conceptual framework

The conceptual framework of this study complied with motivational interviewing theory,[29] the theoretical framework of patient engagement in patient safety,[30] as well as the results of our qualitative study on the safety of community older chronic diseases patients that participated in medication safety management. Figure 1 presents the conceptual framework of this study.

2. Methods

2.1. Design

A PE-MSM program intervention study was performed. This study was conducted in 8 communities subordinated to Lin-shanzhai Community Health Service Center in Zhengzhou, China, as

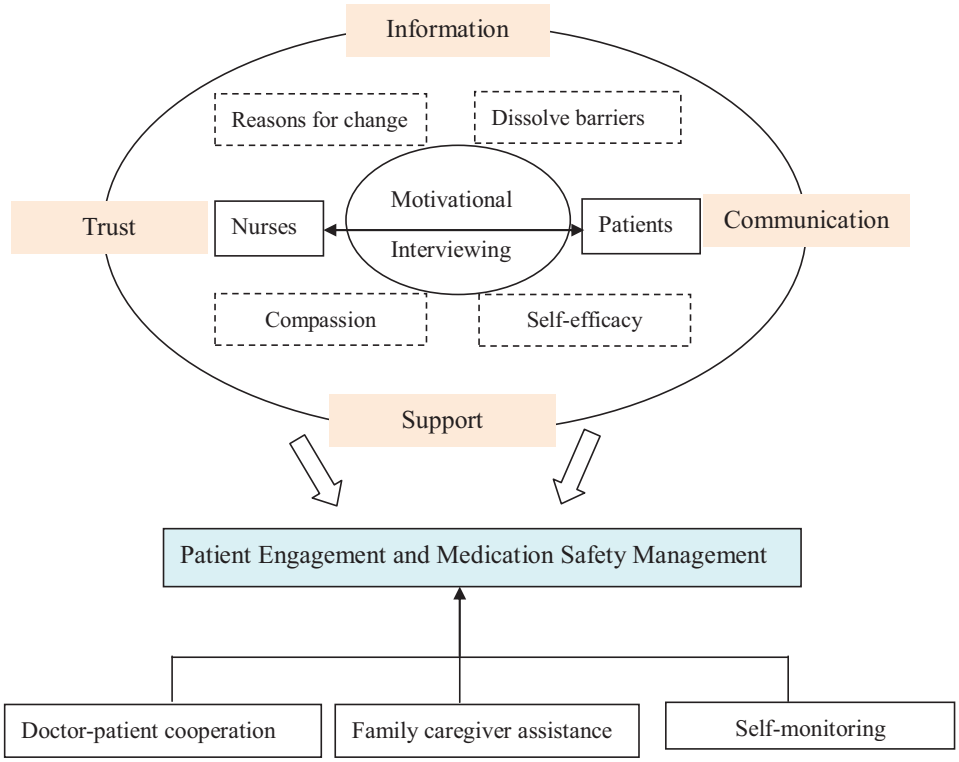

Figure 1. Conceptual framework.

a 12-week trial with a 1 month and 3-month follow-up. The participants of the intervention group took the PE-MSM program, while those in the control groups were provided with medication safety education. The data were collected by a research assistant blinded to group assignment at 4 time points:

1. at baseline, before the intervention started (T0);
2. immediately after the intervention, at 12 weeks (T1);
3. during the first follow-up visit, 1 month after the intervention (T2);
4. during the second follow-up visit, 3 months after the intervention (T3).

2.2. Participants

Participants were included if aged between 65 and 90 years, diagnosed with CVD by secondary or higher medical institutions, at least having 1 of the following 10 types of medication errors[31] (i.e., prescribing error, omission error, improper dose error, wrong time error, unauthorized drug error, compliance error, monitoring error, wrong dosage-form error, deteriorated drug error, and administration-technique error), having normal cognition and language function (with mini mental state examination score ≥27 points), as well as willing to participate in the research. Participants were excluded for those who cannot engage in any activity due to serious chronic diseases. Participants can withdraw if they die or voluntarily ask for withdrawal because of various reasons.

In this study, PASS 11.0 software was employed to calculate the sample size. Based on existing consistent studies on patient activation in community-dwelling patients,[32] a minimum of 96 participants would be required to achieve a medium effect size at a power of 80% and a significance level of 0.05,[33] and assuming a 20% loss to follow-up, the sample size was assessed as 120 participants in this study.

120 older patients from 2 community health service centers (including 8 communities) suffering from CVD were recruited as participants. In order to avoid contamination of the study participants in the same community, the study sorted 8 communities according to the total number of study participants and numbered them into 1 to 8. The computer random number table was used to randomly assign 4 communities in each group according to the 1:1 pairing principle. In the end, there were 62 patients in the intervention group and 58 patients in the control group. Single blinding was adopted because research assistants, who were involved in the collection of data, did not know the patients' group assignment.

2.3. Intervention

2.3.1. Patient engagement and medication safety management (PE-MSM) program.

The PE-MSM program was a well-structured program involving 12-week one-on-one interventions (30–60 minutes per time) with the participants. The intervention team covered researchers, pharmacists, community doctors, and nurses; the site of intervention was located in the community health service center or the participant's home. The auxiliary tools employed in the intervention primarily included the "Instruction Manual of Patient Participating in Safety Medication," the check inventory for medication, the list of medication, the intelligent reminder box, the medication monitoring record form, and the flow chart of patients engaged in medication safety management. Moreover, this PE-MSM program intervention was performed gradually by deepening the awareness of participation and stimulating the participation behavior (week 1–3), developing personalized participation plan (week 4–7), strengthening the sense of participation, and maintaining the behavior of participation (week 8–11), as well as conducting personal feedback and summary (week 12). The intervention is elucidated in Table 1.

2.3.2. Medication safety education.

The participants in the control groups underwent the medication safety education provided by the community health care staffs and researchers, which primarily involved medication information consultation and telephone follow-up services one-on-one. Telephone follow-up focused on medication safety education and unstructured social chatting.

2.4. Outcome measurement

2.4.1. Medication error questionnaire (MEQ).

MEQ was designed given on the definition of various medication errors by the American Society of Hospital Pharmacists[31] and complying with the existing situation of medication errors in older patients with CVD in Chinese communities. There were 10 items in total, and each item was assessed in accordance with 4 levels, that is, "often" (1 point), "sometimes" (2 points), "occasionally" (3 points), and "never" (4 points). In the present study, the lower the questionnaire scores, the higher the incidence of medication errors will be. The Chinese version of MEQ indicates high internal consistency with a Cronbach α of 0.87 in the present study.

2.4.2. Self-efficacy for appropriate medication use scale (SEAMS).

The SEAMS consisted of 13 items and 2 dimensions, as assessed according to 3 grades, that is, "no confident" (1 point), "a little confident" (2 points), and "very confident" (3 points). Moreover, the higher the score of the scale, the higher the self-efficacy of medication will be. The SEAMS has been extensively applied in various groups of chronic disease patients and demonstrated to exhibit high reliability and validity.[34] Moreover, the Chinese version of SEAMS has indicated close internal consistency with a Cronbach α of 0.83 in this study.

2.4.3. Patient activation measure (PAM).

The PAM was used to measure patients' confidence, knowledge, and skills in self-management. A short form of the PAM[35] consisted of 13 items, as assessed according to 4 levels. One to 4 points represent "very disagree," "disagree," "agree" and "very agree," and 0 point indicates "not applicable." The score range of patient activation is 0 to 100 points, according to which the patient activation is split into 4 levels. The score range of the first level to the fourth level respectively refers to ≤47.0 points, 47.1 to 55.1 points, 55.2 to 67.0 points, and ≥67.1 points. The score of patient activation exhibits positive associations with the level of activation. The Chinese version of PAM indicates close internal consistency with a Cronbach α of 0.85 in this study.

2.5. Data collection procedure

Potential participants were screened out and approached in Linshan-zhai Community Health Care Center. After informed consent was provided, socio-demographic and clinical data and baseline outcomes were acquired. Subsequently, the participants were randomized to either the intervention group or the control

Table 1

The patient engagement and medication safety management (PE-MSM) program.

Wk	Themes	Aims and contents	Auxiliary tools	Participation modes
Wk 1	Assess medication error types	Understand the current medication situation of patients: Establish a good relationship with patients Assess the types of medication errors	Instruction Manual of Patient Participating in Safety Medication	Doctor-patient cooperation; Family caregiver assistance;
Wk 2	Raise awareness of participation	Use motivational interview to analyze obstacles of patients' participation Improve the sense of participating in medication safety management	Instruction manual of patient participating in safety medication	Doctor-patient cooperation; Family caregiver assistance;
Wk 3	Motivating participation	Explore patients' experience in medication, share others' cases and stimulate their participation Strengthen confidence in participating in medication safety and enable patients to act	Instruction manual of patient participating in safety medication	Doctor-patient cooperation; Family caregiver assistance;
Wk 4	Develop participation program	Motivate patients to consciously pay attention to the doctor's prescription Give examples to inform patients of the significance of purchasing and taking drugs under the guidance of doctors Enhance the awareness and behavior of participation in medical treatment and medication taking	the check inventory for medication	Doctor-patient cooperation; Family caregiver assistance;
Wk 5	Develop participation program	Assist patients to make a medication list and stick it on the eye-catching place Distribute and teach patients to use intelligent reminder box Deepen the awareness and behavior of participation in home medication	The list of medication; The intelligent reminder box	Doctor-patient cooperation; Family caregiver assistance; Self-monitoring
Wk 6	Develop participation program	Stress the benefits of engaging in medication monitoring Use family support to assist patients with medication monitoring	The medication monitoring record form	Doctor-patient cooperation; Family caregiver assistance; Self-monitoring
Wk 7	Develop participation program	Assist patients to summarize and study the whole process of participating in medication safety management Form individualized patient engagement and medication safety management	The flow chart of patients participating in medication safety management	Doctor-patient cooperation; Family caregiver assistance; Self-monitoring
Wk 8–11	Strengthen the sense of participation and maintain the behavior of participation	Conduct 1time/2-wk telephone follow-up and in-home follow-up to help patients solve problems Inquire and check the medication monitoring record of patients Leave the contact information of researchers and community doctors, and encourage patients to consult about medication management at any time	Instruction manual of patient participating in safety medication	Doctor-patient cooperation; Family caregiver assistance; Self-monitoring
Wk12	Feedback and summary	Acquire the feedback information of patients' participation in medication safety management Improve the intervention program	Instruction manual of patient participation in safety medication	Doctor-patient cooperation; Family caregiver assistance; Self-monitoring

group. The flowchart of the data collection procedure is illustrated in Figure 2.

2.6. Statistical analysis

The SPSS Version 21.0 statistical software was adopted to analyze the data. Descriptive statistics (e.g., mean, standard deviation, and frequency) were adopted to express the participants' demographic and clinical characteristics. By 2 independent samples *t* tests, that is, Chi-Squared test, Fisher exact test, and Mann–Whitney *U* rank-sum test, the characteristics of the 2 groups of participants were compared. The differences between 2 groups were compared with repeated measure ANOVA. A value of $P < .05$ was considered statistically significant.

2.7. Ethical consideration

Ethical approval was obtained from the community health centers and the university at which the study was conducted. All participants in the intervention group and the control group gained a clear insight into the content, purpose, significance, methods, and benefits of the study. Moreover, informed consent was signed for all CVD patients participating in the study. This study provided participants in the control group with the PE-MSM program intervention after the completion of the study.

3. Results

The recruitment, selection, and distribution of patients across the study are illustrated in Figure 2. Lastly, 120 patients were

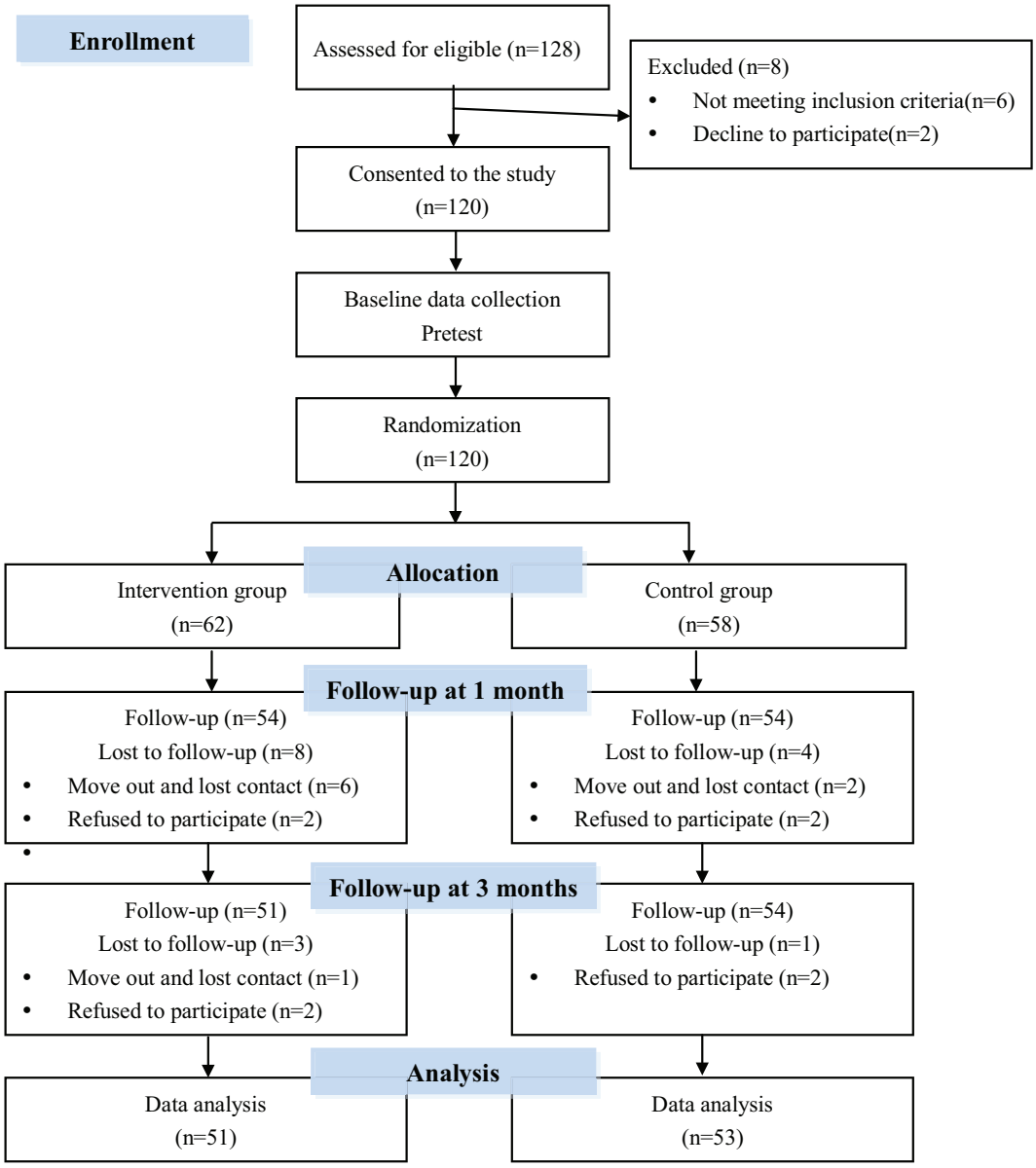

Figure 2. CONSORT flowchart of the study.

recruited and randomized into intervention and control groups.

3.1. Baseline characteristics

Table 2 lists the baseline demographic and clinical characteristics of participants, while Table 3 draws a comparison of baseline outcome variables involving scores of MEQ, SEAMS, and PAM in the intervention and control groups. No significant differences were identified in the baseline data between the 2 groups ($P > .05$).

3.2. Effects of the intervention

Repeated measures ANOVA was performed to determine the effects of the intervention on the incidence of medication errors, self-efficacy for appropriate medication, and patient activation over time. Besides, the relevant results are listed in Table 4. As revealed from the results of the interaction effect between the 4-time points and between the 2 groups, a significant difference was identified between the intervention and control groups in the score of MEQ, the SEAMS, and the PAM ($P < .01$). Moreover, the variations of mean outcomes scores of MEQ, SEAMS, and PAM at 4 time points are separately presented in Figure 3.

Moreover, A Mann–Whitney U test was performed to determine the effects of the intervention on 4 different levels immediately postintervention, 1 month and 3 months, respectively. In Table 5, a significant difference was identified between 4 levels of patient activation between the 2 groups at different time points ($P < .001$). Furthermore, Figure 4 shows the percentage change of the number of participants with 4 different levels of patient activation at 4 different time points in the intervention group.

Table 2

Baseline demographic and clinical characteristics between the 2 groups (n = 104).

Variable	Intervention group	Control group	$t/\chi^2/Z$	P
Age, Mean (SD)	73.86 (4.252)	72.66 (6.288)	1.138*	.258
Gender (n,%)			0.026†	.872
Male	21 (41.2)	21 (39.6)		
Female	30 (58.8)	32 (60.4)		
Marital status (n, %)			2.394†	.122
Married	46 (90.2)	42 (79.2)		
Widowed /Divorce	5 (9.8)	11 (20.8)		
Educational level (n, %)			−0.439‡	.660
Primary school or blow	17 (33.3)	17 (32.1)		
Junior high school	17 (33.3)	24 (45.3)		
high school	12 (23.5)	6 (11.3)		
College or above	5 (9.9)	6 (11.3)		
Residential pattern (n, %)			—	.898
Living alone	5 (9.8)	5 (9.4)		
With a spouse	36 (70.6)	39 (73.6)		
With children	10 (19.6)	8 (15.1)		
Others	0	1 (1.9)		
Monthly income RMB (n, %)			−0.533‡	.594
<1000	7 (13.7)	4 (7.5)		
1000∼	13 (25.5)	11 (20.8)		
2000∼	24 (47.1)	35 (66.0)		
3000∼	7 (13.7)	3 (5.7)		
Current diseases (n, %)			3.147†	.369
Hypertension	45 (88.2)	47 (88.7)		
Diabetes	17 (33.3)	16 (30.2)		
Stroke	15 (29.4)	9 (17.0)		
Others	20 (39.2)	29 (54.7)		
Number of medication types (n, %)			−0.294‡	.769
2∼	19 (37.3)	23 (43.4)		
5∼	23 (45.1)	19 (35.8)		
10∼	9 (17.6)	11 (20.8)		
Monthly medication expenses (n, %)			−0.104‡	.917
<100	(7.9)	11 (20.8)		
100∼	15 (29.4)	10 (18.9)		
200∼	20 (39.2)	12 (22.6)		
500∼	9 (17.6)	18 (33.9)		
1000∼	3 (5.9)	2 (3.8)		
Yr of medication (n, %)			−0.677‡	.499
<1	4 (7.9)	3 (5.7)		
1∼	7 (13.7)	12 (22.6)		
5∼	9 (17.6)	12 (22.6)		
10∼	19 (37.3)	13 (24.5)		
20∼	12 (23.5)	13 (24.5)		
Scores of MBI, Mean (SD)	98.04 (3.48)	99.06 (2.41)	−1.740*	.085
Scores of MMSE, mean (SD)	29.08 (1.32)	29.34 (1.19)	−1.058*	.293

* independent *t* test.

† Chi-Squared.

‡ Mann–Whitney *U* test.

ADL = Modified Barthel Index, MMSE = mini-mental state examination.

4. Discussion and conclusion

4.1. Discussion

Older patients with CVD face major challenges in managing their medication and maintaining a healthy condition. This study reported that the PE-MSM program could lower the incidence of medication errors and enhance self-efficacy of appropriate medication and patient activation among older patients suffering CVD in communities. Medication safety intervention has been extensively employed in various hospital programs for chronic disease patients, and it has been demonstrated with the positive effects on patients' health outcomes.[36,37] However, rare information is available about the effects of a patient engagement and medication safety management program for older patients suffering CVDs in community settings in China.

This study reported that the NMSP significantly down-regulated the incidence of medication errors of elder CVD patients compared with the control group. The mentioned findings comply with those of existing studies[28] which adopted a patient participating in medication safety management intervention in the hospital. The PE-MSM program attempted to take targeted and step-by-step intervention measures in accordance

Table 3

Baseline outcome variables between the 2 groups (n = 104).

	Intervention group, mean (SD)	Control group, mean (SD)	*t*	*P*
Total score of MEQ	22.32 (3.089)	23.21 (3.488)	−1.382*	.170
Total score of SEAMS	21.14 (2.77)	21.98 (2.87)	−1.524*	.131
Total score of PAM	44.28 (6.38)	42.98 (6.78)	1.009*	.316
	Intervention group (n)	**Control group (n)**	***Z***	***P***
PAM				
First level (≤47.0)	37 (72.5)	42 (79.2)	−0.736†	.462
Second level (47.1–55.1)	10 (19.6)	7 (13.2)		
Third level (55.2–67.0)	4 (7.9)	4 (7.6)		

MEQ = medication error questionnaire, PAM = patient activation measure, SEAMS = self-efficacy for appropriate medication use scale.
* independent *t* test.
† Mann–Whitney *U* test.

with the characteristics of patients' medication. For instance, for prescription errors, a check inventory for medication was presented to patients; for omission error, wrong time error, and improper dose error, the list of medication and intelligent reminder box were provided; for monitoring error, a medication monitoring record form and flow chart was issued. Furthermore, the PE-MSM program focused on older CVD patients and allowed the patients and their families to actively communicate with researchers and community medical staffs, provided more professional information on medication, and encouraged their participation. Thus, the incidence of medication errors of participants in the intervention group was lower than that of the control group. An in-depth analysis reported that with the extension of time, the incidence of medication errors decreased first (from T0–T1) and then increased (from T1–T3) in the intervention and the control groups, probably related to the older patients' lack of knowledge and awareness of rational medication, vulnerable to the effect of advertising, surrounding population and price, to complete behaviors (e.g., self-purchase of drugs and drug leakage). The adverse consequence of low medication literacy primarily threatens patients' health, high quality of medication literacy can significantly improve medication compliance and control CVD.[38,39] Thus, the future intervention research should enhance the medication literacy of older patients with CVD, as attempt to ensure the long-term intervention effects.

As revealed from the results of this study, the intervention can significantly enhance patients' self-efficacy of appropriate medication, which complies with a self-care intervention based on motivational interview among patients with heart failure. In this study, the patients were given the "Instruction Manual of Patient Participating in Safety Medication" to understand the causes of CVD and the common types of medication errors in daily medication management, as an attempt to make their own medication situation clear. Subsequently, face-to-face motivational interview was adopted to stimulate their confidence and motivation to change their bad medication habits, enhance their self-efficacy of rational medication, and then facilitate their self-medication management. Chen view that "self-efficacy can be improved via successful experience, verbal persuasion, role model

Table 4

Comparisons of medication errors, self-efficacy for appropriate medication and patient activation between the 2 groups at different time points (n = 104).

		Postintervention			Between subjects effects	Interaction effect time × group
	Baseline	Immediately	1mo	3mo	*F(p)*	*F(p)*
MEQ						
Intervention	22.31 (3.09)	31.69 (2.39)	29.67 (2.805)	29.10 (2.715)	44.640 (0.000)	247.728 (0.000)
Control	23.02 (3.53)	26.00 (3.35)	24.34 (3.216)	24.00 (3.276)		
t/Z	−1.382*	−7.278†	8.988*	8.624*		
P	.170	<.001	<.001	<.001		
SEAMS						
Intervention	21.14 (2.77)	28.96 (2.670	26.51 (2.38)	25.14 (2.42)	31.632 (0.000)	367.434 (0.000)
Control	21.98 (2.87)	23.89 (3.12)	22.02 (2.85)	22.00 (2.86)		
t	−1.524*	8.892*	8.704*	6.028*		
P	.131	<.001	<.001	<.001		
PAM						
Intervention	44.28 (6.38)	56.92 (9.02)	54.97 (8.68)	53.75 (7.910	42.698 (0.000)	132.055 (0.000)
control	42.98 (6.78)	43.60 (6.74)	43.02 (6.75)	42.99 (6.77)		
t	1.009*	8.549*	7.854*	7.462*		
P	.316	<.001	<.001	<.001		

* independent *t* test.
† Mann–Whitney *U* test.
MEQ = medication error questionnaire, PAM = patient activation measure, SEAMS = self-efficacy for appropriate medication use scale.

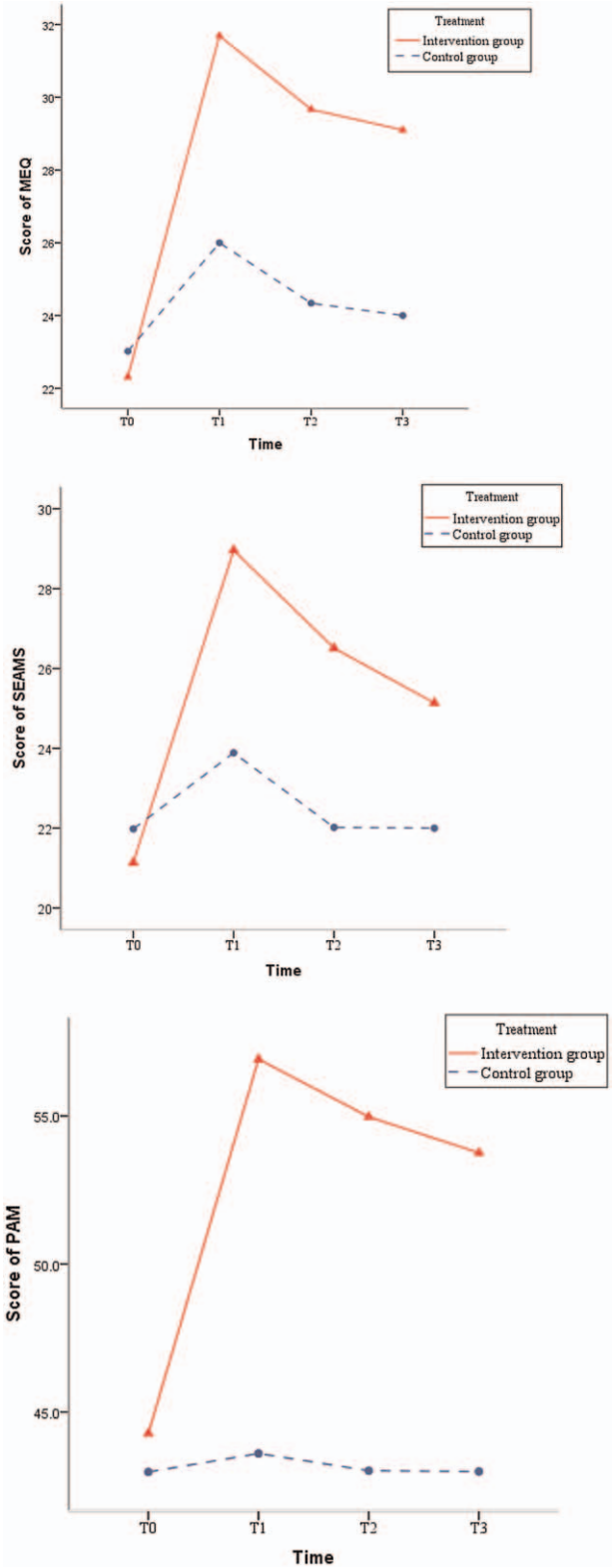

Figure 3. Profile plots of mean outcomes scores by each group for 4 time periods. T0: Baseline; T1: Immediately postintervention; T2: 1 month postintervention; T3: 3 months postintervention. MEQ = medication error questionnaire, PAM = patient activation measure, SEAMS = self-efficacy for appropriate medication use scale.

and positive emotion" to some extent verifies the feasibility of this research intervention program.[40]

Patient activation exhibits positive relationships to self-management behaviors.[41] Compared with the control group, this study combined with the patient's participation in medication safety flow chart and gave patients necessary knowledge, skills, and confidence for self-medication management, actively listened to the patients' suggestions on the PE-MSM program throughout the intervention, and timely modified the intervention program, which greatly promoted patient activation among older patients suffering CVD in communities. However, the results of this study are different from those of Reddy,[42] probably due to the pill bottle were employed in both intervention and control groups in Reddy research although the bottles did not have remind and feedback function the control group. Though the bottles in the control group have no function of reminding and feedback, this measure also had an impact on patient activation, so there is no difference between the 2 groups in scores of PAM. Moreover, with the extension of time, the score and level of patient activation in the intervention group have a downward trend, because patient activation in the nonintervention situation will decrease over time. Accordingly, the long-term effect of the intervention program needs to be further explored.

Several limitations are suggested in this study. First, participants in this study were recruited from community health service centers by convenient sampling, thereby may be cause the results bias and reduced the generalizability of the findings. Second, when patients take 5 or more drugs every day, it is called polypharmacy. Seventy five percent of the patients in this study are polypharmacy patients. Future research should pay attention to the medication management of polypharmacy patients and take targeted intervention programs to reduce their medication burden. Third, in this study, questionnaire and scale were adopted to assess the intervention effect, whereas there was no objective evaluation index. In the future, we can consider increasing the incidence of cardiovascular accidents and economic benefits. Moreover, the study did not focus on related clinical outcomes, since some indicators were not feasible in a community setting. Moreover, a long period of follow-up, multiples testing and the application of intention-to-treat (ITT) analysis should be addressed in future studies.

4.2. Conclusion

In conclusion, the patient engagement and medication safety management program significantly reduces the incidence of medication errors, improves self-efficacy of appropriate medication and the activation of elderly patients with CVD in the community, which has contributed to the idea of medication safety management needing actively patient engagement and strong support involving health professional in chronic disease medication management programs.

4.3. Practice implications

This study develops an effective and feasible approach that may not only empower patients with medication knowledge and skills to proactively manage their own chronic conditions to function optimally and offer guidelines to health professionals, which stresses the significance of phased and targeted medication safety management in a community setting. The PE-MSM program may

Table 5

Comparisons of 4 levels of patient activation between the 2 groups in 4 time points (n = 104).

	Intervention group (n = 53)				Control group (n = 51)					
Time	First level	Second level	Third level	Fourth level	First level	Second level	Third level	Fourth level	*Z*	*P*
Baseline	37	10	4	0	42	7	4	0	−0.736	.462
Immediately	6	22	12	11	42	7	4	0	−6.745	.000
1 mo	7	26	10	8	42	7	4	0	−6.396	.000
3 mo	10	25	11	5	42	7	4	0	−5.822	.000

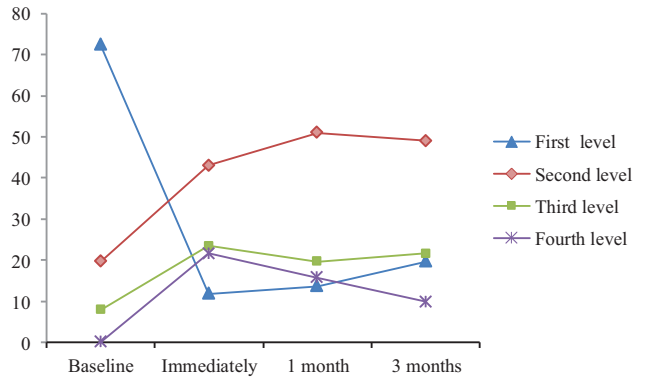

Figure 4. Profile plots of the percentage of the number of participants with 4 levels of patient activation in intervention group.

be a promising medication management mode for the routine health care of older adults suffering CVD in communities.

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