

RESEARCH ARTICLE

Influence of chronic illness resources on self-management and the mediating effect of patient activation among patients with coronary heart disease

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Abstract

Aim: The aim of this study was to explore the relationship between chronic illness resources, patient activation and self-management behaviour among middle-aged and older patients with CHD.

Design: A cross-sectional, descriptive correlational study was performed.

Methods: A convenience sample of 296 participants were recruited in Tianjin, China. Data were collected by using the Chronic Illness Resource Survey (CIRS), Patient Activation Measure (PAM) and Coronary Artery Disease Self-Management Scale (CSMS). Descriptive statistics and Pearson's correlation analysis were used to data analysis. Linear regression analysis was performed to explore the mediating role of patient activation.

Results: The results showed that chronic illness resources and patient activation were significantly and positively correlated with self-management behaviours ($p < .01$). Patient activation had a partial intermediary between chronic illness resources and self-management behaviours, and the mediation effect was 0.230. Patient activation mediated the relationship between chronic illness resources and self-management. In order to improving the self-management behaviours, medical staff need to pay attention to the importance of chronic illness resources and patient activation.

KEYWORDS

chronic illness resources, coronary heart disease, cross-sectional study, patient activation, self-management

1 | INTRODUCTION

Coronary atherosclerotic heart disease, also referred to coronary heart disease (CHD), is a common type of cardiovascular disease and a major public concern in China (Bai and Wang, 2019). During the last decade, the death number of global cardiovascular disease has increased by 12.5%, and in 2017, cardiovascular disease accounts

for one third of global human death (GBD, 2018). The trend of the prevalence of chronic diseases in China from 2018–2025 shows that the prevalence of CHD is still on the rise (from 1612.79/100,000–1895.91/100,000) (Cao et al., 2020). CHD is the most prevalent diseases and a main cause of hospitalization, mortality and health-care expenditure (Zhang et al., 2019). Percutaneous coronary intervention (PCI) was a common treatment for CHD which were

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executed more than 560,000 cases in China in 2015 (Chen et al., 2017). However, people with CHD are at high risk of recurrent cardiac events (Yusuf, 2002). Patients who suffered acute coronary syndrome were often accompanied with physical and psychological symptoms including limitation in daily activities and depression (Zhang et al., 2018). Surgery, a high recurrence rate and physical, psychological changes have a substantial impact on the quality of life, and they have been growing dramatically the burden for the family and healthcare services (Dorje et al., 2018; Zhang et al., 2018).

In order to reduce the burden of medical prevention and disease management, it is of great practical significance for patients to play a full role in the long-term management. Patients adjust to the changes of physical and psychological, and they also need to improve behaviours related to secondary prevention, such as monitoring signs and symptoms, incorporation of key medications, adhering to treatment and keep healthy lifestyle (Dorje et al., 2018; Huynh-Hohnbaum et al., 2015). These behaviours are referred to self-management. Through the self-management behaviour, the individual has the ability to manage the disease symptom and maintain physical, psycho-social health and healthy lifestyle. Effective self-management requires the support of different resources (Fortmann et al., 2011). Social support can promote healthy disease related behaviour of patients, that is, it is important to encourage patients in maintaining health and overcoming the disease with an positive attitude.

Previous studies revealed that high level of social support could improve chronic illness self-management behaviour (Zhao et al., 2019). Successful CHD self-management needs social support from families, friends and doctors, in addition to patient's own efforts. In addition to encouragement from close relatives, intangible resources also may act as significant role for self-management behaviour of CHD. Based on multilevel "pyramid" model of social-environmental support, the Chronic Illness Resources Survey (CIRS) was developed by Glasgow, which covered main support from family, friends, healthcare resources, as well as distal sources of support from neighbourhood, media, workplace, public policies and community (Glasgow et al., 2000; Zhong et al., 2016). Patient activation is considered as individual's knowledge, skills, confidence and behaviours for the necessary of self-managing condition or health (Hibbard et al., 2004). Researches showed that patients with higher levels of positive accompanying better self-management behaviours and clinical outcomes, and the benefits of patient activation improved functioning, and lower use of costly healthcare services over time (Hibbard et al., 2015). Patient activation is an important predictor of self-management and chronic illness resources usage. Furthermore, studies have shown that due to the lack of social support, the patients had more emotional distress and a negative attitude towards disease (Pan, et al., 2019; Witt et al., 2016).

Given the concept of patient activation, self-efficacy is considered. Self-efficacy is defined the individual can have confidence to perform a specific behaviour and achieve the expected result (Chen, 2020). Compared with self-efficacy, patient activation is measured as multidimensional (self-management knowledge, skills

and confidence), and self-efficacy is an influential factor of patient activation (Hibbard et al., 2009). Recently, self-efficacy was demonstrated a causal mediation between chronic disease resource utilization and self-management behaviours in a cross-sectional survey of diabetes (Zhong, 2015). However, there is no certification of the mediating role of patient activation in CHD. Based on these premises, a cross-sectional study was conducted to explore the relationship between chronic illness resources, patient activation and self-management behaviours among patients with CHD in China. This variable might also predict the level of patient activation. Furthermore, the more positive the patient was, the better their self-management behaviours were. Thus, the aim of this study was to explore the relationship between chronic illness resources, patient activation and self-management behaviour among middle-aged and older patients with CHD.

2 | METHODS

2.1 | Study design

A survey design was used with questionnaires from July–December 2019. Data collection on background information of demographics, chronic illness resources, patient activation and self-management behaviour were conducted to explore the relationship between them.

2.2 | Setting and samples

Participants were recruited from two hospitals located in Tianjin. The selection criteria of the sample of participants were (a) patients aged over 45 years old; (b) patients diagnosis with CHD; (c) CHD duration is more than three months to ensure the relatively stable condition; (d) having the ability to understand and converse; and (e) being able to voluntary participate in the study. Persons who were difficulty to communication (severe mental or cognitive disorder) and unable to complete the questionnaire (cardiopulmonary insufficiency, arrhythmia or severe comorbidity), were not included. According to the standards, data collection was performed by the researchers. At any time, at least one researcher was present at the area where participant filled in the questionnaires. The sample size was estimated based on the method of estimation of Kendall, that was, sample was at least 5 to 10 times of empirical indicator in multivariate analysis (Fang & Lu, 2002). There were 36 empirical indicators, resulting in a required sample size of 180 to 360 cases for this study, and 360 CHD inpatients included in this study.

2.3 | Data collection

The data were collected from July–December 2019. Data collection included demographic information, chronic illness resources,

patient activation and self-management behaviour. The investigators were trained about the procedure to improve the validity of the survey. A study code was assigned to each patient to ensure anonymity. Based on the inclusion and exclusion criteria, 360 patients with CHD were recruited from two hospital in Tianjin, whereas 64 invalid questionnaires were removed, from which a total of 296 eligible questionnaires were obtained, and the valid response rate was 82.22%.

2.4 | Ethical considerations

This study obtained the research ethical committee approval from Tianjin University of Traditional Chinese Medicine. All CHD patients were informed about the purpose of study, and all participants signed written informed consent before being enrolled in the research. This study ensured the anonymous reporting of participants' information.

2.5 | Measurements

2.5.1 | Demographics

Demographic variables include age, gender, marriage status, educational level and income. Moreover, CHD-related information, such as duration and history of acute myocardial infarction, was collected.

2.5.2 | Chronic illness resource survey (CIRS)

In 2000, CIRS was compiled by Glasgow and it was used to measure multiple social resources for self-management of patients with chronic diseases (Glasgow et al., 2000). The Chinese version of CIRS was translated by Zhong and revised by Yao in chronic diseases (2016). CIRS consisted of seven dimensions (healthcare team, family and friends, personal, neighbourhood or community, media and policy, organizations, workplace), which explained the sources of support for patients with chronic diseases. This was a five-point Likert scale, ranging from 1 (not at all) to 5 (a great deal). Cronbach's α of CIRS was 0.82.

2.5.3 | Patient activation measure (PAM)

PAM consisted of 13 items and was developed by Hibbard and his colleague (Hibbard et al., 2004). PAM is an instrument measuring knowledge, beliefs about illness and medical care, and self-efficacy for self-management among the patients with chronic disease (Banvolgyi et al., 2016). PAM ranks from 0–100, with a higher score representing a higher level of positive, and it assigns patients to four levels of activation: score of 47.0 or lower is in level 1; score of 47.1–55.1 is in level 2; score of 55.2–67.0 is in level 3; score of 67.1 or

above is in level 4 (Banvolgyi et al., 2016). In the present study, the Chinese version of PAM was used and its Cronbach's α is 0.81.

2.5.4 | Coronary artery disease self-management scale (CSMS)

Self-management behaviours of CHD patients were measured by CSMS in Chinese version, which was developed by Ren (Ren et al., 2009). Twenty-seven items of CSMS divided into 3 dimensions: daily life self-management behaviours; medical self-management behaviours; emotional self-management behaviours. This was a five-point Likert scale, each item was rated on 0–5, with a higher score meaning better self-management behaviours (Ren et al., 2009). Average score was calculated for actual score dividing the maximum possible score and then multiplied by 100%. Self-management behaviour with CHD in this study was divided into 3 levels: low level of self-management (the score ≤ 60), medium level (the score was 60–80) and high level (the score ≥ 80). The Cronbach's α coefficient of CSMS is 0.913, which has been widely used in the application of CHD self-management behaviour in China.

2.6 | Data analysis

SPSS version 21.0 (IBM Corporation) was used to analyse the data. Descriptive statistics were used to describe demographic characteristics, the levels of chronic illness resources, patient activation, and self-management behaviour. The correlations between chronic illness resources, patient activation and self-management behaviour were analysed by Pearson's correlation coefficient. The linear regression method was used to analyse the mediating effect of patient activation on the relationship between chronic illness resources and self-management behaviour. In order to establish a valid mediation model, there were three steps as follows: Step 1: the mediator (patient activation) must predict the independent variable (chronic illness resources); Step 2: the independent variable (chronic illness resources) must be a predictor of the dependent variable (self-management behaviour); Step 3: and the dependent variable (self-management behaviour) must predict the mediator (patient activation). If there is a significant relationship between the independent and dependent variables in Step 3, that is, partial mediation will be considered (Baron & Kenny, 1986). Significance was set at a $p < .05$.

3 | RESULTS

3.1 | Participants characteristics

The participants were recruited from among 360 patients with CHD from two hospital in Tianjin, whereas 64 invalid questionnaires were removed, from which a total of 296 eligible

questionnaires were obtained, and the valid response rate was 82.22%. The demographics of participants are summarized in Table 1. The mean age of CHD patients was 65.46 ± 10.43 . There was a predominance of individuals who were female (184, 62.16%), aged 56 to 66 years (111, 37.50%) and married (258, 87.16%). The majority of participants were live with their families (266, 89.86%), retired (238, 80.41%). More than half of the participants earned over 3,000 yuan (168, 56.76%). There were 90 (30.41%) participants who had obtained an education level of high school. In terms of clinical characteristics, most of the CHD participants' disease duration were more than three years (165, 55.74%), and only with one kind of comorbidity (127, 42.91%). The majority of them had no family history (144, 48.65%) and acute myocardial infarction history (248, 83.78%). Other characteristics of participants are shown in Table 1.

3.2 | The level of CIRS, CSMS and PAM among CHD

The mean (*SD*) of chronic illness resources, self-management behaviours is shown in Table 2. The total mean score of chronic illness resources and self-management behaviours was 49.46 (8.17) and 81.96 (10.80), respectively. The highest item mean score of chronic illness resources was "healthcare team" (3.78 ± 0.49), and the lowest item mean score was "organizations" ($M = 1.28, SD = 0.34$). The highest item mean score of self-management behaviours was "daily life self-management behaviours" ($M = 3.50, SD = 0.55$), and the lowest item mean score was "medical self-management behaviours" ($M = 2.71, SD = 0.45$). According to the distribution, patient activation was presented as median (inter-quartile range). In our study, the total score of patient activation was range from 51.92 ~ 96.15, the median was 71.15 (66.73, 75.00). The numbers of four level were as follows: 3

Characteristics	Project	n (%)
Age	45 ~ 55	45 (15.20)
	56 ~ 66	111 (37.50)
	67 ~ 77	105 (35.47)
	≥78	35 (11.82)
Gender	Male	112 (37.84)
	Female	184 (62.16)
Marriage status	Married	258 (87.16)
	Divorced/widowed	38 (12.84)
Household	Alone	30 (10.14)
	Living with families	266 (89.86)
Educational level	Primary education or below	55 (18.58)
	Junior school	89 (30.07)
	High school	90 (30.41)
	College degree or above	62 (20.95)
Income	≤1,000	13 (4.39)
	1,001 ~ 3,000	115 (38.85)
	≥3,001	168 (56.76)
Employment	Currently employed	28 (9.46)
	Retired	238 (80.41)
	other	30 (10.14)
Duration (year)	≤1	95 (32.09)
	≥3	165 (55.74)
History of acute myocardial infarction	Yes	48 (16.22)
	No	248 (83.78)
Family history	Yes	129 (43.58)
	No	144 (48.65)
	Uncertain	23 (7.77)
Comorbidities (number)	0	84 (28.38)
	1	127 (42.91)
	≥2	85 (28.72)

TABLE 1 Participants' characteristics (n = 296)

TABLE 2 Level of chronic illness resources and self-management behaviours ($n = 296$)

Variables	Mean \pm SD (domain)	Mean \pm SD (item)	Rank
Healthcare team	11.33 \pm 1.48	3.78 \pm 0.49	1
Family and friends	8.19 \pm 2.31	2.73 \pm 0.77	5
Personal	8.61 \pm 2.01	2.87 \pm 0.67	4
Neighbourhood or community	9.10 \pm 2.77	3.03 \pm 0.92	2
Media and policy	8.82 \pm 2.05	2.94 \pm 0.68	3
Workplace	8.10 \pm 3.05	2.70 \pm 1.01	6
Organizations	2.55 \pm 1.03	1.28 \pm 0.34	7
Chronic illness resources	49.46 \pm 8.17	2.36 \pm 0.39	-
Daily life self-management behaviours	28.02 \pm 4.40	3.50 \pm 0.55	1
Medical self-management behaviours	40.70 \pm 6.69	2.71 \pm 0.45	3
Emotional self-management behaviours	13.24 \pm 2.32	3.31 \pm 0.58	2
Self-management behaviours	81.96 \pm 10.80	3.04 \pm 0.40	-

Abbreviation: SD, standard deviation

participants (1.01%) in level 1; 72 participants (24.32%) in level 2; 221 participants (74.7%) in level 4, and there was no participant in level 1.

3.3 | Relationship analysis among CIRS, CSMS and PAM

According to the results of Pearson's correlation analysis, chronic illness resources and patient activation were significantly and positively correlated with self-management behaviours in total score. In detail, all subdomains of the chronic illness resources were significantly correlated with self-management behaviours ($p < .01$) excluding healthcare team ($r = 0.087$, $p > .05$). Furthermore, three subdomains of self-management behaviours: daily life self-management behaviours ($r = .013$, $p > .05$), medical self-management behaviours ($r = .102$, $p > .05$) and emotional self-management behaviours ($r = .083$, $p > .05$) all have no correlation with healthcare team. What more, daily life self-management behaviours ($r = .124$, $p > .05$) and daily life self-management behaviours ($r = .129$, $p > .05$) had no significant with workplace. In addition, all subdomains of chronic illness resources were significantly correlated with patient activation ($p < .01$). It also showed that patient activation were significantly correlated with self-management behaviours ($r = .585$, $p < .01$). As shown in Table 3.

Effect of patient activation in patients with CHD on chronic illness resources and self-management behaviours.

Regression analyses were used to explore the relationships between patient activation on chronic illness resources and self-management behaviours. The results are shown in Table 4. In Step 1, taking self-management behaviours as the dependent variable and chronic illness resources as an independent variable, the result shows that the regression effect of chronic illness resources on self-management is significant ($F = 123.619$, $p < .01$). In Step 2, taking patient activation as the dependent variable and chronic illness resources as an independent variable, the regression effect

of chronic illness resources on self-management is also significant ($F = 136.081$, $p < .01$). In Step 3, the result with statistically significant shows that the regression coefficient of chronic illness resources decreases from 0.544–0.314 after adding the patient activation, furthermore, R^2 increases from 29.6%–41%, indicating that patient activation has a partial intermediary between chronic illness resources and self-management behaviours. The mediation effect was 0.230 ($0.563 \times 0.408 = 0.230$, $p < .01$), direct effect was 0.314 ($p < .01$) and the total effect was 0.544 ($p < .01$) (Figure 1). The mediating effect made up 42.28% ($0.230/0.544$) of the total effect.

4 | DISCUSSION

Unhealthy lifestyle behaviour has shown to be major cause of death, including smoking, harmful alcohol consumption, physical inactivity and so on (World Health Organization, 2013). Recently, self-management is becoming an important component for patients with chronic diseases such as diabetes or CHD. Therefore, it is necessary for patients to make changes in lifestyle for secondary prevention of CHD, such as maintaining regular exercise, eating a heart-healthy diet, quitting smoking, adherence to a medication regimen (New Zealand Guidelines Group, 2014). In this study, the score of self-management behaviours is 81.96 \pm 10.80, indicating that self-management behaviours in middle age and older patients with CHD are unsatisfactory, which is consistent with previous studies (Chen & Hua, 2019; Dawkes et al., 2016). As shown in Table 2, the score of daily life self-management behaviours is the highest in all subdomains, the following is emotional self-management behaviours and the last is medical self-management behaviours, indicating that maintaining healthy daily life is relatively good in CHD patients. With the development of the economy, most of persons are paying more attention to keeping a healthy living habit. Most of the participants in this study are retired, and they have more time for physical exercise and disease management. However, cognitive and knowledge

TABLE 3 Relationship between chronic illness resources, self-management behaviours and patient activation

Variable	HT	FF	P	NC	MP	W	O	C-Total	D-B	M-B	E-B	S-Total	PA
HT	1												
FF	0.039	1											
P	0.026	0.526**	1										
NC	0.048	0.498**	0.485**	1									
MP	0.101	0.281**	0.293**	0.330**	1								
W	0.016	0.138	0.133	0.193	0.065	1							
O	0.086	0.252**	0.190**	0.377**	0.216**	0.151	1						
C-Total	0.267**	0.695**	0.672**	0.763**	0.561**	0.554**	0.481**	1					
D-B	0.013	0.498**	0.388**	0.410**	0.245**	0.124	0.132	0.411**	1				
M-B	0.102	0.382**	0.367**	0.261**	0.477**	0.129	0.223**	0.452**	0.452**	1			
E-B	0.083	0.356**	0.339**	0.366**	0.298**	0.371*	0.235**	0.451**	0.317**	0.457**	1		
S-Total	0.087	0.514**	0.457**	0.406**	0.460**	0.243**	0.544**	0.750**	0.904**	0.904**	0.628**	1	
PA	0.228**	0.360**	0.491**	0.372**	0.394**	0.276**	0.563**	0.390**	0.530**	0.530**	0.456**	0.585**	1

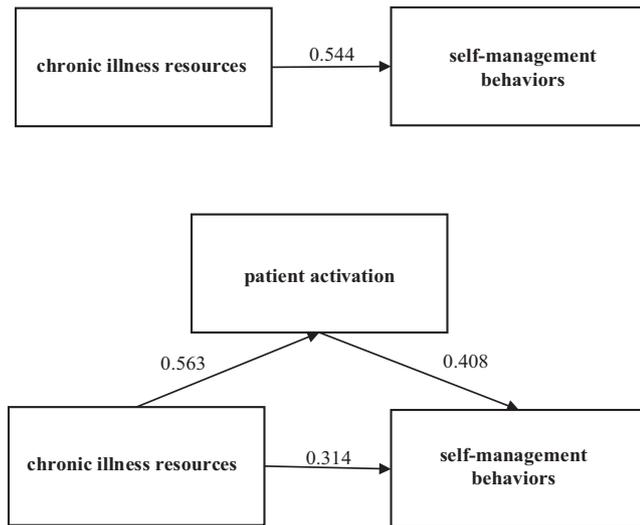
Abbreviation: C-Total, total score of chronic illness resources; D-B, Daily life self-management behaviours; E-B, Emotional self-management behaviours; FF, Family and friends; HT, Healthcare team; M-B, Medical self-management behaviours; MP, Media and policy; NC, Neighbourhood or community; O, Organizations; P, Personal; PA, Patient activation; S-Total, total score of Self-management behaviours; W, Workplace.

* $p < .05$; ** $p < .01$.

TABLE 4 Regression analysis of variables ($n = 296$)

Dependent variable	Independent variable	β	t	F	R ²	Adjusted R ²
Self-management behaviours	Chronic illness resources	0.544	11.118**	123.619**	0.296	0.294
Patient activation	Chronic illness resources	0.563	11.665**	136.081**	0.316	0.314
Self-management behaviours	Chronic illness resources	0.314	5.794**	101.751**	0.410	0.406
	Patient activation	0.408	7.519**	-	-	-

* $p < .05$; ** $p < .01$.

**FIGURE 1** Mediation model of patient activation in chronic illness resources and self-management behaviours

of disease in patients with CHD still needs to be improved (Chen & Hua, 2019). The reason for low level of symptom management, emergency management and disease knowledge may be related to the lack of patients' cognition of the disease and corresponding management skills (Du et al., 2020).

In order to improve the ability of self-management behaviours, necessary interventions need to conduct, ranging from teaching disease knowledge among chronic illness patients to improve their ability and skills for living and maintain positive attitude (Zhong et al., 2016). However, well performed self-management behaviour needs the support of micro-level (ability of an individual, social support) and macro-level (economic conditions and culture norms) (Hinder & Greenhalgh, 2012). All of these are in the CIRS. In this study, the level of utilization of resources is unsatisfactory, and the score (2.36 ± 0.39) is less than 3 which is the intermediate point. In Table 2, the score of healthcare team is the highest in all subdomains, which is consistent with previous study (Wang & Zhang, 2020). Support from medical staff is an important resource who will give direct guidance to patients with chronic diseases during their hospitalization (Cao et al., 2018). Most of participants get knowledge from their medical staff through various forms to improve their ability of self-care ability (Ning et al., 2015). Furthermore, score of neighbourhood or

community subdomain is also high in CHD patients, which is higher than the research of Shang (2019). This difference may be there are 80.41% retired patients in our study and most of them have time to communicate with other CHD patients by sharing knowledge, experiences, emotions, and skills, which can improve symptoms, positivity of treatment and effectively manage healthy behaviours (Foster et al., 2007).

In this study, the score of patient activation ranges from 51.92–96.15 (the median is 71.15). 74.7% ($n = 221$) CHD patients are in level 4, which is higher than published researches (Zhou et al., 2020), indicating that, in this study, most of the CHD patients have confidence, skills and a positive attitude to manage their illness. 24.32% ($n = 72$) CHD patients are in level 3, indicating that this group of patients realize the importance of self-management without confidence and skills to maintain their health. Only 3 individuals do not realize the significance of self-management lacking of knowledge, skill and confidence. This reason is that most of patients, living in the central of city, are convenient for achieving medical information resources, which make them have a better understanding of disease and have a positive attitude to improve health. Furthermore, researches summarized that household, education level, income and disease severity were related to patient activation (Chen, 2017; Shively et al., 2013). While, all of these groups account for a high proportion in this study, which is another reason for the higher patient activation.

This study shows that chronic illness resources, patient activation were significantly and positively correlated with self-management behaviours. Recently research shows that social aspects (support from family, friends and healthcare etc.) are significant for promoting self-management behaviours; furthermore, it highlighted the positive relationship between chronic illness resources and self-management behaviours (Sato et al., 2020). Witt et al. (2016) indicated that support of emotional support and information from media promoted patients activation. Support from social resources positively influence patients' attitude and the physical activity levels (Sato et al., 2020). A systematic review summarized that patient activation was an effect intervention on improving self-management behaviours in diabetes patients (Almutairi et al., 2020).

Chronic illness resources are an important component of the cognitive and affective to maintain good self-management

behaviour. Furthermore, the patient activation affects the knowledge, skills, confidence and attitude of treatment, and then affects the self-management behaviour of patients. The findings of this study suggest that patient activation partly mediates chronic illness resources and self-management behaviours, that is, medical staff have different ways to improve self-management behaviours among CHD patients. They can improve self-management behaviours through improving social support from reasonable utilization resource or improving patient motivation from the perspective of psychological cognition. Thus, intervention that aims to improve utilization resource and patient activation may result in better self-management behaviours.

5 | CONCLUSIONS AND LIMITATIONS

This study revealed that the level of patient activation is high among patients with CHD in China; however, chronic illness resources and self-management behaviours were inadequate. This study proved that chronic illness resources and patient activation were positively correlated with self-management behaviours. Furthermore, the results showed that patient activation partly mediated chronic illness resources and self-management behaviours. Thus, in order to improving the self-management behaviours, medical staff need to pay attention to the importance of patient activation. There were several limitations in this study. Owing to a cross-sectional design, convenience sampling was used from two hospital in Tianjin, China, which could lead to sampling bias and might not be generalized to populations of other geographic regions. In addition, self-report measures could appear to be response bias, that is, deviation caused by the psychological or personality disposition of the respondents (Zhao et al., 2019). Despite the limitations, self-report measure is one of the most feasible methods for data collection (Stirratt et al., 2015).

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CONFLICTS OF INTEREST

There are no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data of this work were limited by Tianjin University of Traditional Chinese Medicine, and the research data are confidential.

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