



Self-management in patients with coronary heart disease after stent implantation at the long-term stage: a cross-sectional study

Haixiang Zhu^{1^}, Guohong Chen^{1^}, Xiaohui Xue^{2^}, Sufen Zheng^{1^}

¹Department of Cardiology, Zhejiang University School of Medicine, Sir Run Run Shaw Hospital, Hangzhou, China; ²Department of Gastroenterology, Zhejiang University School of Medicine, Sir Run Run Shaw Hospital, Hangzhou, China

Contributions: (I) Conception and design: H Zhu; (II) Administrative support: H Zhu; (III) Provision of study materials or patients: S Zheng; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: X Xue; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Haixiang Zhu. Department of Cardiology, Zhejiang University School of Medicine, Sir Run Run Shaw Hospital, Hangzhou, China. Email: 3203070@zju.edu.cn.

Background: The self-management of risk reduction in coronary heart disease (CHD) plays an important role in mediating health outcomes following percutaneous coronary intervention (PCI), but there is a lack of research on self-management status in the long-term stage after PCI in Chinese patients with CHD. Hence, this study investigated the self-management status in the long-term stage (>2 years) after PCI in patients with CHD. The results could provide a reference for the development of targeted interventions.

Methods: This cross-sectional study administered a questionnaire survey on self-management in patients with CHD who underwent PCI (convenience sampling) and had been discharged from our medical center for >2 years, excluding the patients with severe hepatic or renal dysfunction or tumor. Data about cardiovascular risk factors, including body mass index (BMI), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and self-management status, were collected. The Coronary Artery Disease Self-Management Scale (CSMS) was used to assess patient self-management.

Results: The total CSMS score was 69.5 ± 11.0 , suggesting that the patients' self-management level was average. The scores for life management, emotion management, and disease management were 87.4 ± 9.7 , 77.6 ± 7.7 , and 57.5 ± 11.0 , respectively. Significant differences were noted in the patients' self-management scores according to occupation, education level, residence, and sex (all $P < 0.05$). The self-management ability of farmers, primary school-educated, and male participants was relatively low. Moreover, cardiovascular risk factors were positively correlated with the emotion and disease management scores.

Conclusions: CHD patients' self-management status in the long-term stage after PCI was moderate or poor. Medical staff should provide targeted guidance and education (for example, effective guidance on smoking cessation, first aid training, repeated disease education, and use of electronic devices to improve medication compliance) to improve the self-management level for the secondary prevention of CHD.

Keywords: Cardiovascular risk; self-management; disease management; education level; coronary heart disease (CHD)

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[^] ORCID: Haixiang Zhu, 0000-0003-2013-9221; Guohong Chen, 0000-0002-2021-8707; Xiaohui Xue, 0000-0002-7126-6805; Sufen Zheng, 0000-0001-8767-7310.

Introduction

Coronary heart disease (CHD) is the leading cause of death and health-related economic burden in the world, accounting for approximately 31% (17.9 million) of all deaths each year (1). CHD accounts for more disability-adjusted life-years than highly-prevalent diseases such as diabetes and cancer (2). Although percutaneous coronary intervention (PCI) greatly reduces the mortality of patients with acute-stage CHD, standardized disease management is needed after PCI (3,4). Secondary prevention of CHD and self-management (considered tertiary prevention) are crucial to improving risk factors and reducing disease burden and disability following coronary angioplasty (5).

Self-management, i.e., activities for actively participating in the management of one's disease, involves active self-behavior management and self-behavior supervision in disease progression. Self-management behaviors include medication adherence, physical activity, and diet (6). Some scales can be used to assess self-management in patients with CHD, such as The Heart Health Self-Efficacy, Self-Management (HH-SESM) scale, the Cardiovascular Management Self-Efficacy Scale, and the Coronary Artery Disease Self-Management Scale (CSMS) (7). The CSMS was designed by Ren *et al.* for Chinese patients with CHD (7). Meta-analyses showed that patients who underwent PCI and have good physical activity management could lower overall mortality by 13% and cardiac mortality by 26% at 12, 15, and 24 months (8). Nevertheless, the degree of self-management can vary among patients with different situations, and a specific patient with CHD might also have a different self-management in the acute *vs.* long-term chronic stages (9). In addition, the increasing prevalence of long-term conditions and comorbidities is a major clinical and public health challenge. Research on the self-management of patients with CHD in China has focused mainly on hospitalized patients and less on outpatients (10) and rarely on the long-term self-management status of patients who underwent PCI. Moreover, the literature on outpatients is confined to investigating patient adherence to lifestyle modifications without assessing the patients' self-management ability (11). Therefore, this study investigated the long-term self-management status of patients with CHD approximately 2 years after PCI. The findings will provide a reference for the development of targeted interventions. We present the following article in

accordance with the STROBE reporting checklist (available at <https://apm.amegroups.com/article/view/10.21037/apm-21-2465/rc>).

Methods

Ethics approval and informed consent

This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and the study protocol was approved by the Ethics Committee of Sir Run Run Shaw Hospital, Zhejiang University School of Medicine (Approval No. 20190725-166). Informed consent was obtained from all participants before survey initiation.

Study design

A questionnaire survey on self-management was performed in patients with CHD who underwent PCI and were discharged from our medical center from October 2016 to July 2017. The patients were selected by convenience sampling. We collected the data at discharge [cardiovascular risk factors, including body mass index (BMI), total cholesterol (TC), low-density lipoprotein (LDL)] and 2 years after PCI (cardiovascular risk factors and CSMS scores). The survey after PCI was performed from January 2019 to June 2019, and the collection time was in the order of patient discharge. The patients were invited to fill out the questionnaire.

The inclusion criteria were (I) primary diagnosis of CHD and history of PCI treatment, (II) 18-75 years of age, and (III) willingness to participate in the study for free. The exclusion criteria were (I) severe hepatic and renal dysfunction, (II) New York Heart Association Classification 3-4, (III) tumors, mental disorders, or other life-shortening diseases, or (IV) inability to complete the questionnaire or refusal to cooperate.

Patient and public involvement statement

The participants were informed of the purpose of the investigation, matters requiring attention, conflicts of interest, and data confidentiality in the informed consent form. The survey was conducted anonymously, and the survey results were presented to the participants in the form of a literature publication. The study was conducted on a fully informed and consensual basis, and no investigators

were recruited as the study did not involve clinical trials. Finally, 225 patients were selected based on the eligibility criteria, whereas 45 declined participations.

Questionnaire scales

The covariates were selected according to the main risk factors of CHD indicated in the Chinese cardiovascular disease report, i.e., age, sex, hypertension, dyslipidemia, smoking, abnormal glucose tolerance, obesity, family history, eating high-calorie, high-fat, and high-sugar diet. The general characteristics included the following 15 domains: sex, age, education level, medical insurance, occupation, living conditions, marital status, past medical history, the total number of implanted stents, blood lipids, BMI, and autonomic symptoms.

CHD self-management scale

The CSMS, designed by Ren *et al.* (7), is based on three major aspects of self-management (daily life management, disease management, and emotional management), combined with the specific disease management skills that patients with CHD need to master, such as first aid technology and angina symptom management. The scale has a total of seven domains. This study used three domains according to the cohort's need: daily life management domain (including habit management, such as smoking/drinking/diet and general life management, such as regular work and rest/activities); disease medicine management domain (including symptom management, first aid management, disease knowledge acquisition management, and treatment compliance management, medication adherence); and emotion management domain (as tips for relaxation/methods of self-encouragement, etc.), for a total of 27 items. The 5-level Likert scoring method was used for each item. Forward scoring questions were scored 1 to 5 points from “never” to “always” for 135 points. Higher total scores indicated better self-management behavior. The scores of the knowledge questionnaire were converted into a percentage. Self-management scores of >90, 75–89.9, 55–74.9, and <55 were considered good, fairly good, average, and poor, respectively (7). The higher the total score, the better the self-management behavior. Cronbach's coefficient was used to determine the internal consistency reliability of the CSMS. The total scale reliability index was 0.913, and the reliability coefficient for the retest of each dimension was 0.718–0.900.

Data collection and quality control

Before the survey, the principal investigator provided homogeneous training to all surveyors, addressing the survey process and tools, the significance of questionnaire entries, and precautions during the survey. A unified instruction form was used during the survey to explain the research purpose and questionnaire requirements to all respondents in detail. After providing informed consent, the participants filled out the questionnaire anonymously. For problems encountered by the respondent, the investigators used the unified instruction form for further explanation. The time to complete the questionnaire was 20–30 min. The completed questionnaires were recovered on-site. Questionnaire data were entered uniformly. A questionnaire was considered invalid when >15% of the questions were unanswered (12). After original data were entered, they were double-checked by another member to ensure the correctness of the data entry. The questionnaire survey of the patients after PCI was conducted 1 h before the outpatient return visit, which was scheduled in advance by telephone.

Sample size

According to the studies on influencing variables, a sample size is considered sufficient if the number of patients is at least 5–10 times the number of independent variables. According to the questionnaire used in the present study, the sample size was estimated to be at least 135–270 cases.

Statistical analysis

Measurement data with a normal distribution were expressed as mean \pm standard deviation, and categorical variables were expressed as percentages. The independent sample *t*-test was used for comparison between two groups, while one-way ANOVA was used for the comparison of three or more groups. Variables with significant differences in the univariable analyses were selected to be included in a multivariable linear regression using the enter method. Multiple categorical non-ordinal variables (occupation and place of residence) and ordinal variables (age, education level, total number of stents, years since the first PCI, discharge BMI, and recent BMI compliance) were set as dummy variables and included in the regression equation for analysis. SPSS 23.0 (IBM, NY, USA) was used for data analysis. Two-sided $P < 0.05$ was considered significant.

Table 1 Body mass index and blood lipid at discharge and 2 years after PCI

Indicators	Mean (SD)	t value	P value
BMI at discharge	25.1 (3.2)	3.67	<0.01*
BMI 2 years after PCI	24.7 (2.9)		
TC at discharge	4.17 (1.28)	5.09	<0.01*
TC 2 years after PCI	3.74 (0.91)		
LDL at discharge	2.23 (0.99)	5.59	<0.01*
LDL 2 years after PCI	1.86 (0.66)		
HDL at discharge	1.06 (0.31)	0.952	0.343
HDL 2 years after PCI	1.04 (0.32)		

*, represents statistically significant results. BMI, body mass index; PCI, percutaneous coronary intervention; TC, total cholesterol; LDL, low-density lipoprotein cholesterol; HDL, high-density lipoprotein cholesterol; SD, standard deviation.

Table 2 CSMS of CHD patients at 2 years after PCI [mean (SD), n=166]

Variables	Mean (SD)	F value/t value ^Δ	P value
Farmer	64.1 (10.0)	7.683	<0.01*
Worker	69.4 (10.8)		
Administrative/public institutions	80.9 (10.1)		
Self-employed	69.5 (10.7)		
Retired	73.0 (12.4)		
Lower than primary school	63.7 (9.0)	6.304	<0.01*
Primary school	67.3 (12.1)		
Middle school	72.0 (11.7)		
Tertial level of education	76.5 (10.8)		
Male	65.5 (11.5)		
Female	76.5±12.1	5.054 ^Δ	<0.05*

^Δ, represents values from t-test; *, represents statistically significant results. CSMS, Coronary Heart Disease Self-Management Scale; CHD, coronary heart disease; PCI, percutaneous coronary intervention; SD, standard deviation.

Results

General data

Overall, 180 questionnaires were distributed, and 176 were returned, of which 10 were invalid, for a return rate of

92.2%. The 166 patients were 64.3 (11.2) years old, 72.9% were men, 25.3% had diabetes, 72.9% had hypertension, 59.6% had more than two stents, 65% were farmers and retirees, and 73.5% had a primary or secondary education level. Moreover, 94% of the respondents lived with their families, 51.2% in cities, and 35.5% in rural areas and suburbs.

Physical and laboratory indicators

The assessment of the physical and laboratory indicators is provided in the [Supplementary File](#). The BMI, TC, and LDL values at 2 years after PCI were lower than at discharge from the hospital (*Table 1*).

CHD self-management scale scores of patients 2 years after PCI

The average CSMS score was 69.5±11.0, and the corresponding rating was average, indicating that the patient's self-management level was low. Only 28.9% of patients had a good rating (≥75 points). The scores of each domain were 87.4±9.7 for life management, 77.6±7.7 for emotion management, and 57.5±11.0 for disease management. These results showed that among all dimensions of self-management, life management was the best, while disease management was the weakest. The CSMS scores of the different patients are shown in *Table 2*. The comparison of the self-management scores of the different patients with CHD after PCI during the secondary prevention period showed significant differences in self-management among patients with different occupations, education levels, and sex. Administrative managers had the highest score of 80.9±10.1, whereas farmers had the lowest score of 64.1±10.0 (P<0.01). Patients with a tertiary level of education had the highest score of 76.5±10.8, and those with a lower than primary school level of education had the lowest score of 63.7±12.1. These results indicated that patients with different educational levels have different levels of patient management: the self-management ability of patients with a tertiary education level was higher than that of patients with primary school education. In addition, women had higher self-management scores than men (*Table 2*).

The multivariable linear regression analysis showed that sex (Beta =−5.264, P=0.027), HDL at discharge (Beta =5.256, P=0.031) and occupation (administration/public institutions *vs.* farmer: Beta =18.184, P<0.001; retired *vs.* farmer: Beta =6.306, P=0.033) were associated with the self-

Table 3 Multiple linear regression analysis of self-management scores

Variables	Beta	Standard error	t value	P value
Sex (female vs. male)	-5.264	2.358	-2.232	0.027*
HDL at discharge	5.256	2.413	2.178	0.031*
Occupation				
Worker vs. farmer	4.685	3.049	1.536	0.127
Administrative/public institutions vs. farmer	18.184	4.445	4.091	<0.001*
Self-employed vs. farmer	3.918	3.684	1.064	0.290
Retired vs. farmer	6.306	2.921	2.158	0.033*

*, represents statistically significant results. HDL, high-density lipoprotein cholesterol.

management scores (*Table 3*).

The comparison of emotion management and disease management scores of patients with CHD with different characteristics during the secondary prevention period is shown in *Table 4*. The scores of emotion management were related to sex, occupation, educational level, and recent TC levels. The scores of emotion management were higher among women than among men ($P=0.005$), the highest among the patients in administration/public institutions in terms of different occupations ($P=0.006$), the highest among those with a tertiary level of education ($P=0.018$), and higher in patients with healthy TC levels than in those with unhealthy TC levels ($P=0.020$). The comparison of disease management scores of CHD patients with different characteristics after PCI indicated differences in disease management scores due to different education levels and occupations ($P<0.01$). The patients' disease management scores indicated a significant difference in TC levels at discharge, and the recent BMI of patients with high disease management scores was better than that of patients with low disease management scores ($P=0.045$).

Discussion

In this study, the general self-management of Chinese patients 2 years after PCI was average, but life management behavior was good while disease management behavior was poor. In addition, patients with different educational levels had different levels of patient management, i.e., being higher in more educated patients and higher in women. Furthermore, the multivariable linear regression analysis showed that sex, HDL levels at discharge, and occupation were associated with the self-management scores.

The patients' self-management levels were moderate/

poor at 2 years after PCI. The self-management mean score of the patients was 69.5 ± 11.0 at 2 years, which was rated average, with the highest score in the life management behavior (rated as good) and the lowest score in the disease management behavior (rated as poor). The scores in the present study were lower than those from the study by Liu *et al.* (13) (performed during hospitalization) and those from the study by Hu *et al.* (14) (conducted at 1–2 weeks after PCI). These results could be explained by the fact that with the prolonged course of the disease, self-management was not given sufficient attention by the patients, or the patients lost interest in self-management with elapsing time after the acute episode. Indeed, during hospitalization, the medical staff provides various self-management instructions continually. Then, at 1–2 weeks after discharge, the family members and friends still show great concern for the patient because of the recent hospitalization. Thus, the patients performed quite well in self-management and obtained high scores in the initial stage of the disease. Then, the decrease in social support with time might affect the patients' self-management. Moreover, the patients themselves also did not pay sufficient attention to their self-management because of the feeling that "prolonged illness makes a doctor of a patient." In the three aspects of self-management, the scores of disease management were the highest in the study by Liu *et al.* (13) of in-hospital patients, whereas it was the lowest after hospital discharge, either close to discharge or 1 year after discharge. Indeed, during hospitalization, the patients can receive quick answers to the queries, but after discharge, their disease-related questions and issues cannot be easily solved in time.

Interestingly, although the patients' self-management level was relatively low, their BMI, TC levels, and LDL levels were lower than after discharge. Self-management

Table 4 Scores of emotion management and disease management with different factors

Variables	Emotion management			Disease management		
	Mean (SD)	F value/t value ^Δ	P value	Mean (SD)	F value/t value ^Δ	P value
Male	70.3 (21.2)	2.898 ^Δ	0.005*	58.4 (15.2)	0.788 ^Δ	0.432
Female	80.5 (16.4)			56.5 (15.1)		
Farmer	71.6 (17.7)	3.790	0.006*	50.4 (13.3)	8.344	<0.01*
Worker	82.7 (16.0)			56.4 (12.5)		
Administrative/public institutions	90.5 (11.7)			71.3 (15.4)		
Self-employed	76.3 (17.2)			59.6 (10.6)		
Retired	79.4 (19.6)			63.0 (16.1)		
Lower than primary school	71.7 (20.0)	3.448	0.018*	49.8 (12.5)	6.540	<0.01*
Primary school	74.2 (19.3)			55.0 (15.2)		
Middle school	81.8 (16.5)			61.5 (14.4)		
Tertial level of education	83.2 (14.2)			65.7 (15.3)		
Suburbs	75.2 (22.7)	0.362	0.697	55.2 (13.9)	3.918	0.022*
Rural area	77.2 (17.0)			54.2 (15.1)		
Urban area	78.8 (18.1)			60.9 (15.1)		
Without symptoms	78.7 (17.7)	0.432 ^Δ	0.671	56.6 (15.2)	4.445 ^Δ	0.037*
Showing symptoms	76.8 (15.6)			62.7 (14.3)		
TC at discharge ≥5.17 mmol/L	78.0 (19.6)	0.088 ^Δ	0.930	52.7 (12.1)	4.615 ^Δ	0.033*
TC at discharge <5.17 mmol/L	77.7 (18.1)			59.0 (15.6)		
Recent TC ≥5.17 mmol/L	63.1 (22.5)	2.343 ^Δ	0.020*	60.8 (18.4)	0.580 ^Δ	0.563
Recent TC <5.17 mmol/L	78.5 (17.8)			57.6 (15.1)		
BMI at discharge (normal) 18–25	77.3 (17.1)	0.160	0.958	59.4 (14.7)	0.906	0.462
BMI at discharge (overweight) 25.1–28	78.3 (19.2)			56.5 (16.5)		
BMI at discharge (obese) 28.1–32	77.1 (21.4)			54.3 (14.8)		
Recent BMI (normal) 18–25	77.1 (17.0)	0.511	0.728	60.5 (15.2)	3.156	0.045*
Recent BMI (overweight) 25.1–28	79.2 (19.6)			55.9 (15.3)		
Recent BMI (obese) 28.1–32	74.8 (20.4)			51.7 (12.5)		
LDL at discharge ≥1.8 mmol/L	77.2 (18.3)	−0.383 ^Δ	0.703	56.3 (14.8)	−1.425 ^Δ	0.156
LDL at discharge <1.8 mmol/L	78.3 (18.4)			59.7 (15.6)		
Recent LDL ≥1.8 mmol/L	76.2 (18.9)	−0.921 ^Δ	.358	58.6 (14.9)	0.558 ^Δ	0.577
Recent LDL <1.8 mmol/L	78.8 (17.9)			57.2 (15.4)		
HDL at discharge <0.9 mmol/L	77.2 (19.7)	−0.234 ^Δ	0.815	57.0 (14.5)	−0.442 ^Δ	0.659
HDL at discharge ≥0.9 mmol/L	77.9 (17.8)			58.1 (15.5)		
Recent HDL <0.9 mmol/L	74.1 (22.3)	−1.497 ^Δ	0.139	56.1 (14.8)	−0.968 ^Δ	0.335
Recent HDL ≥0.9 mmol/L	79.3 (16.1)			58.6 (15.4)		

^Δ, represents values from *t*-test; *, represents statistically significant results. BMI, body mass index; TC, total cholesterol; LDL, low-density lipoprotein cholesterol; HDL, high-density lipoprotein cholesterol; SD, standard deviation.

therapy in patients with CHD is regarded as non-drug treatment because it is relatively safe in everyday life and compatible with concurrent medication therapies. Its core content is to effectively reduce the risk factors of CHD through non-drug treatment intervention, such as daily diet, weight management, increased physical exercise, and smoking cessation (15). A person with good self-management is motivated to self-regulate to attain the desired goal or behavioral endpoint, engaging in disease management actions and changing unhealthy behaviors. Patients with CHD frequently require support to self-manage health behaviors such as medication adherence, consuming a healthy diet, and engaging in physical activity, which is known to reduce the risk factors associated with CHD, such as BMI, TC, LDL, and HDL. Compared with the values at discharge, the recent BMI, TC, and LDL values were reduced in patients with lower self-management levels. One of the reasons might be related to missing data of CSMS at discharge; it is a limitation that we only collected the CSMS data after discharge, as we did not conduct a longitudinal study. Moreover, it could be associated with the five cardiac rehabilitation prescriptions after PCI, especially the role of drugs in reducing TC levels after PCI. For patients with CHD at the secondary stage of prevention, the full use of the Intelligent Cloud Outpatient Platform might also improve the self-management level. Zhou *et al.* (16) designed self-management software for patients with inflammatory bowel disease, including health education, medical records, reminders, virtual community, and information center. Based on the cloud platform, this software can support many terminal applications, such as smartphones, tablets, and computers. The application of this self-management software can provide references for the self-management of chronic clinical diseases. Healthcare institutions can also carry out video education, timely consultation, video, and telephone visits to patients through public platforms such as websites, APP, QQ groups, or WeChat, providing timely and continuous reminders to patients to pay attention to their self-management. Patients can also use apps to improve their self-management level, such as using medication warning software to reduce the rate of forgetting drug intake, joining the follow-up groups provided by medical institutions, and paying real-time attention to disease-related information to improve their self-awareness of disease management. Nurses in tertiary hospitals can make full use of the advantages of online hospital services to provide support to patients, carry out online disease management consultation and

supervision, and cooperate with community hospitals to improve the self-management skills of patients with CHD during secondary prevention. For middle-aged and older patients, attention should also be focused on supervising the education of their families, conducting regular telephone and outpatient follow-ups, increasing doctor-patient interaction, and regularly guiding and supervising the patients in their disease management.

The multivariable linear regression analysis showed that sex, HDL at discharge, and occupation were associated with self-management scores. This study's results indicated that occupation influenced the self-management behavior of patients with CHD. The patients from administration or public institutions scored higher than patients from other groups in each dimension and the total level of self-management, which shows that good social support is helpful for patients with CHD to maintain good self-management behavior. Those from administration or public institutions generally had a higher education level, stable occupation and income, and more time and energy to pay attention to their health problems. In this study, 73.5% of the participants only had primary or secondary education, but the results suggested that self-management was better in patients with tertiary education, which is consistent with the research results of Yang *et al.* (17) and Mao *et al.* (18). Because of older age combined with a low education level, most of them were faced with challenges in understanding the instructions about the drugs and their diseases. Hence, the patients might not have reasonably guided their medication behavior, which was finally reflected in their poor disease management behavior (19). Patients with a high education level have high self-recognition and learning abilities, allowing timely recognition of the important influencing factors of diseases in daily life. They also have a strong ability to understand and use medical knowledge, which leads to regular reviews, good self-monitoring, and timely treatment after the onset of diseases. Moreover, the women scored higher in self-management behavior than men, which is consistent with the results of most domestic studies (13,14). Thus, because women pay more attention to self-image, physical changes, and health status than men, they acquire more disease management skills through various methods. Moreover, as women are more willing to express their emotions than men and tend to turn to others for help and supervision regarding their worries and unclear knowledge, they do well in self-management. The results also provide nursing staff and patients' relatives guidance on dealing with male patients, who generally do not easily

express their needs and helplessness because of strong self-esteem. It would require people associated with the patient to take the initiative to give attention and guidance with carefully chosen ways and methods to avoid hurting their self-esteem.

The present survey identified a few factors associated with disease management and emotion management in patients with CHD. The scores of disease management were higher among urban patients than among suburban patients and higher among suburban patients than among rural patients. The results reflect the conditions in China's national medical system, in which medical resources are more concentrated in urban areas; thus, urban residents can enjoy better medical services than those in the suburbs and rural areas. Due to long distances, inconvenient transportation, and lack of resources, the disease management of suburban patients is affected. It is consistent with the research report of Xu *et al.* (20), which emphasized the need for improving the primary health care system and suggested gradually narrowing the gap between urban and rural areas. The measures include enhancing the cooperation between general and primary hospitals to receive timely and effective treatment after PCI in both hospital grades, which would be both practical and convenient for the patients. Meanwhile, disease and emotion management scores were the highest in patients with a tertiary level of education and those in administration/public institutions. The reasons might mostly be similar to the association mentioned above between self-management and education. Moreover, we found that cardiovascular risk factors were positively correlated with emotion and disease management scores. The patients with higher scores of emotion management had healthier recent TC levels, and the patients with higher scores of disease management had better recent BMI management. The self-management protocol was first applied in 2002 (21), mainly by having the patients reduce their saturated fat and cholesterol intake and encouraging regular physical activity; 6-8 weeks later, the patients' blood lipid levels were significantly improved. The patients continued with self-management control without requiring medication. Multiple studies (22-25) have confirmed that self-management helps reduce LDL, TC, HDL, and glucose levels; controlling blood pressure; losing weight, and improving anxiety, depression, disease awareness, and long-term effectiveness in patients with CHD. The results of these intervention studies are consistent with those of our study, which explains the positive correlation between

cardiovascular risk factors and the scores of emotion management and disease management. However, despite a higher disease management score of the patients that resulted in a healthier TC level at discharge, no correlation was found between self-management and the recent healthier TC levels. It was completely unexpected, and we look forward to investigating this in future studies.

There are some limitations to this study. The number of participants was not sufficiently large, and all the study participants were from a tertiary hospital in Hangzhou. This limitation may have contributed to the failure to analyze the relationship between disease management and recent TC levels. In the future, we intend to expand the research scope. Moreover, the CSMS of patients with CHD was disregarded at discharge. A complete data collection could help find more differences in self-management variables. Similar investigations and intervention studies should be conducted in other regions and hospitals with different grades and adequate sample sizes. Finally, this was a cross-sectional study with inherent shortcomings.

Conclusions

In the long-term, patients with CHD after PCI had an overall low level of self-management. The factors influencing self-management included occupation, education level, sex, and residence. Emotion management was positively correlated with recent TC levels, and disease management was positively correlated with recent BMI. Therefore, medical staff should find ways to improve patients' self-management skills, give guidance, and support in disease management and emotion management.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at <https://apm.amegroups.com/article/view/10.21037/apm-21-2465/rc>

Data Sharing Statement: Available at <https://apm.amegroups.com/article/view/10.21037/apm-21-2465/dss>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://apm.amegroups.com/article/view/10.21037/apm-21-2465/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and the study protocol was approved by the Ethics Committee of Sir Run Run Shaw Hospital, Zhejiang University School of Medicine (Approval No. 20190725-166). Informed consent was obtained from all participants before survey initiation.

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Appendix 1

The questionnaire to analyze the patients' self-management and health status in the last 6 months

Questionnaire

Dear Mr./ Ms:

Thank you for participating in our survey, which aims to analyze your self-management and health status in the last 6 months, so that we can make a more effective plan for the health management of patients after coronary heart disease stent operation and promote people's health.

The principle of voluntary participation in this study, if you are willing to participate in this study, please answer the project questions truthfully, it will be very important to the objective conclusion, we promise to keep your information confidential, thank you very much!

I.Basic information

At discharge:

cholesterol----mmol/L ;LDL(Low density lipoprotein) ----mmol/L; HDL(High density lipoprotein) ----mmol/L;BMI(Body mass index)----

Recently:

cholesterol ----mmol/L; LDL----mmol/L ;HDL----mmol/L ; BMI----

Cholesterol standard : 3.11 mmol/L-5.17 mmol/L .

1). ≥ 5.17 mmol/L Not met; 2). < 5.17 mmol/L Met standard

LDL 1.8 mmol/L-3.36 mmol/L. 1). ≥ 1.8 mmol/L Not met; 2). < 1.8 mmol/L Met standard

HDL 0.83-1.97mmol/L. 1). < 0.9 mmol/L Not met ; 2). ≥ 0.9 mmol/L Met standard

BMI: 1)Light <18 2) Normal 19-25; 3) Overweight 26-28; 4) 29-32 fat ; 5) Extreme overweight >32 .

1. Gender: 1). male 2). Female

2. age: 1) <30 ; 2) 30-39 ; 3)40-49; 4) 50-59 ; 5) 60-69; 6) >70 .

3. History of Diabetes 1). Yes; 2) No

4. History of hypertension. 1). Yes; 2) No

5. Total number of supports .1)1 ; 2) 2; 3) 3 ; 4) 4 or more

6. whether the PCI is for emergency. 1). Yes; 2) No

7.How long is it from the first PCI . 1) In 1year ; 2) 1-2years ; 3) 3-5year ; 4)More than 5 years

8. Occupation 1) farmer; 2) Worker; 3)Teacher ; 4) Student

- 5)civil servants/businesses; 6) Freelance ; 7) Housewife; 8) Retirement
9. Education: 1)Illiteracy; 2)primary ; 3) secondary; 4) university
10. Medical insurance. 1)self-expense 2)Agricultural insurance 3)Commercial insurance
- 4)Provincial and municipal health insurance
11. Marital status.1) unmarried; 2)Married ; 3) Divorce; 4) Widowed
12. Residence. 1) live alone; 2) live with family; 3)Nursing institution
13. Place of residence. 1) suburb; 2) Rural ; 3) City ; 4) Other
14. Post-operative symptoms. 1)no ; 2) Chest tightness and fatigue; 3) discomfort;

II. CSMS scale

A. Habits Management

1. follow the advice on quitting smoking

1) never ; 2) almost no; 3) sometimes; 4) often; 5) always

Criteria for scoring : 1 = Smoking more than 6 cigarettes per day; 2=Smoking 3-5 cigarettes per day; 3=Smoking 1-3cigarettes per day; 4=Smoking occasionally; 5= Never smoking

2. follow dietary salt limits

1) never; 2) almost no ; 3) sometime; 4) often; 5) always

3-5g of sodium salt per day according to coronary heart disease dietary requirements

Score 1=Sodium >210 g per month

Score 2 =180-210 g of sodium salt per month

Score 3 =150-179 g of sodium salt per month

Score 4 =120-149 g of sodium salt per month

Score 5=Sodium <120 g per month

3. Comply with recommendations to limit alcohol

1) never ; 2) almost no; 3) sometimes; 4) often; 5) always

Score 1= >60 ml pure alcohol per time (beer >520 ml, wine >180; liquor >45 ml)

Score 2=40 ml-60ml pure alcohol per time (beer 350-520 ml, wine 120-180 ml, liquor 30-45 ml)

Score 3= <40 ml pure alcohol per time (beer 350 ml, wine 120 ml, liquor 30 ml) and regular drinking

Score 4= <40 ml pure alcohol per time (beer 350 ml, wine 120 ml, liquor 30 ml) and

occasional drinking

Score 5=Never drink

4. Compliance with fat and cholesterol limits

1) never ; 2) almost no; 3) sometimes; 4) often; 5) always

(Recommended Dietary Evaluation Form for the Prevention and Control of Blood Lipid Disorders in Chinese Adults 2007)

Project	Score
1. Would you had meat <75 g/d in the last week : 0= no; 1= yes	
2. What kind of meat do you eat : 0= lean , 1= marbled meat ,2= fat ,3= visceral	
3. Number of eggs you eat in the past week: 1=0-3per week ,2=4-7per week ,3= more than 7 per week	
4. Number of fried foods eaten in the past week: 0= not eaten ,1=1-4 times per week ,2=5-7 times per week ,3= more than 7 times per week	
5. Number of times you eat cream pastry in the last 1 weeks :0= not, 1=1-4 times per week ,2 5-7 times per week	
Total score	

Note: According to the CSMS score requirements, fat and cholesterol dietary evaluation table

scores into. Score 1=Dietary Assessment Score > 6 scores;

Score 2= Dietary Assessment Score 4-5;

Score3 =Dietary Assessment Score 3;

Score4=Dietary Assessment Score 2;

Score 5= Dietary Assessment Score 1.

B. symptom management

1. Monitoring of angina attacks (frequency, extent, duration)

1) never; 2) almost no ; 3) sometimes ; 4) often; 5) always

Score 1= Never recorded angina

Score 2= Recorded every 15-30 days

Score 3=Recorded every 7-14 days

Score 4=Recorded every 3-7 days

Score 5= Recorded every 1-2 days

2. Regular monitoring of pulse rate and heart rate

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

3. Regular monitoring of blood pressure

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

4. Summarize your illness and write down the questions you need to ask

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

C. Emotional Cognitive Management

1. Using self-relaxation techniques when feeling nervous and excited

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

2. Encourage yourself when you feel depressed

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

3. Have the confidence to keep the disease from affecting oneself

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

4. Enjoy leisure and entertainment

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

D. Emergency Management

1. Carry first aid

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

2. Families learn first aid knowledge

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

3. When the disease attacks,you can identify and correct self-help

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

E. Disease Knowledge Management

1. Focus on the side effects of drugs

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

2. Pay attention to the effect and usage of drugs

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

3. Learning about disease health in various ways

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

4. Communicate disease information and feelings with others (including medical staff, patients, etc.)

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

5.Plans and goals for life, exercise, etc. to overcome disease

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

F. daily life management

1. Balancing work, activity and rest

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

2.Participation in recommended activities and exercises

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

1=Never participate in recommended activities (e.g. walking, swimming, dancing, Taijiquan, climbing stairs, etc)

2=less than 30 minutes per week

3 = 30 to 60 minutes per week

4 = 1 to 3 hours per week

5 =more than 3 hours per week

3. Keep the daily routine

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

4. Reasonable diet nutrition

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

G. Treatment Compliance Management

1. Periodic review

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

1= 0 reviews in the past 3 months

2=1 review in the past 3 months

3= 2 reviews in the past 3 months

4=3 reviews in the past 3 months

5= More than 4 reviews in the past 3 months

2. Obey to the prescribed medication

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

3. Regular vaccination of recommended vaccines

1) never; 2) almost no; 3) sometimes; 4) often ; 5) always

Influenza Vaccination (0)(1)(2)(3)(4)(5)(6) times

Vaccination against pneumonia (0)(1)(2) times

(Score method : 0=0, 1-2=1 points, 3-4=2 points , 5-6=3 points;

Vaccination against pneumonia :0=0, 1=2 points; The two vaccine scores are added to the entry score)

Results:

The total score is 135, and then converted according to percentage. Less than 35 points for poorly self-health management; Scores from 35 to54.99 means poor self-management; scores from55 to74.99 for commonly self-management ; scores from75 to 89.99 for good self-management , More than 90 for excellent self-management.