

# Self-Management Ability of Patients with PICC Catheter and Its Influencing Factors

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## Research Article

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# Abstract

**Objective:** Explore the self-management ability of patients with PICC catheter and its influencing factors, so as to provide basis for improving self-management ability.

**Methods:** A total of 240 patients with PICC catheter in a Grade-A hospital are investigated by convenient sampling. *Personal Information Questionnaire*, *Tumor Patient PICC Self-management Ability Scale*, and *Social Support Scale (SSRS)* are used to complete the questionnaire survey.

**Results:** The overall average score of self-management ability of the patients with PICC catheter is  $138.43 \pm 20.34$  (< 144th), and the self-management ability is moderate. The results of Single factor analysis shows that the patients with low age, high education, long-term caregivers, high monthly income, non-self-expense, religious belief and mental work had higher scores of self-management ability ( $P < 0.05$ ). There is a significant positive correlation between the score of social support and the score of self-management ability ( $P < 0.05$ ). The results of multivariate analysis suggests that education, long-term care, age, monthly per capita income, payment method, religious belief, occupational nature and social support are all influencing factors of self-management ability of patients with PICC catheter.

**Conclusions:** 1. The overall level of self-management ability of patients with PICC catheter is medium, and the ability of information acquisition and daily catheter observation need to be improved. 2. Age, education level, long-term caregivers, monthly per capita income, payment method, religious belief, professional nature and social support, etc. will pose a direct impact on the self-management ability of patients with PICC catheter.

## Introduction

Peripherally Inserted Central Catheter (PICC) implantation refers to a new way of catheterization through peripheral veins (cephalic vein, basilic vein, median vein) to reach the central vein. <sup>[1]</sup> Nowadays, many research results have regarded PICC catheter as an ideal tool for intravenous infusion of tumor patients, and has been widely used in clinical work. <sup>[2]</sup> Unfortunately, with the increase of application frequency, its complications begin to highlight. Swaminathan holds that early detection and active treatment of complications will help to improve the effectiveness of treatment. <sup>[3]</sup> Patients with PICC catheters in China mainly adopt the way of home self-cultivation to maintain the normal function of the catheter, ensure the safety of patients, and ensure the life span of the catheter to play a positive role for patients with PICC catheter. Self-management ability refers to a series of self-prevention and health care activities carried out by patients with the help of health care workers, which involves emotional management and disease management. Some scholars report that self-management ability can effectively improve patients' compliance with nursing work. <sup>[4]</sup> During PICC catheterization, if the patients' self-management ability is relatively poor, their negative emotions will increase, resulting in an increase in the frequency of complications. Accordingly, how to improve the self-management ability of patients with PICC catheter has become an important problem to be solved by health care workers.

# 1 Objectives And Methods

## 1.1 Research Objectives

From September 2018 to March 2019, a questionnaire survey is conducted among 240 patients with PICC catheter who met the inclusion and exclusion criteria for PICC maintenance in the PICC clinic of a Grade-A hospital in Taizhou. Inclusion criteria:(1) Clinically diagnosed as malignant tumor; (2) PICC patients who have been indwelled for PICC outpatient maintenance and hospitalization; (3) voluntary participation in the study, with weekly follow-up; (4) 18-80 years old; (5) no cognitive impairment or mental illness; (6) informed consent of the subjects and their family members. Exclusion criteria: (1) poor physical condition; (2) lack of consciousness; (3) patients who could not receive regular follow-up for more than 7 days; (4) patients with pacemaker or arteriovenous fistula.

### 1.1.1 Sample size calculation

In the quantitative research part, according to the sample size requirements of exploring the influencing factors of relevant variables, the sample size is at least 5-10 times the number of variables. The number of dimensions involved in this study is 7 dimensions and 35 items. Therefore, the number of items in the scale 35 is taken as the benchmark for calculating the sample size, and the relevant factors such as capital, manpower and time are fully combined. Therefore, the sample size is determined to be 175 to 350 cases in this study.

In this study, 260 questionnaires are actually sent out, 245 are recovered, 240 valid questionnaires (excluding the questionnaires with more missing values and the same number of choices), and the effective recovery rate is 92.3%. Finally, 240 valid questionnaires are analyzed.

## 1.2 Methods

### 1.2.1 Survey tool

#### 1.2.1.1 General data survey scale

The questionnaire is designed by the investigators to investigate the basic situation of the patients, including gender, age, occupation, education, marital status, income, disease diagnosis, catheterization and maintenance registration form. Full-time nurses carefully fill in the relevant contents and keep abreast of the actual situation in the process of taking care of patients at any time.

#### 1.2.1.2 Self-management ability scale

In order to explore the self-management ability of patients with PICC catheterization, this paper chooses the "Cancer patients PICC self-Management ability scale" compiled by Liu Chunli, which includes seven different dimensions, a total of 35 items. The Cronbach's  $\alpha$  coefficient of the scale is 0.904 and the test-retest reliability is 0.933. The content involves the daily life of patients with catheter, exercise with catheter, compliance of catheter maintenance, daily catheter observation, information acquisition, abnormal situation treatment, catheter management confidence, etc. The patients' answers are assigned as 5 points, 4 points, 3 points, 2 points and 1 point respectively according to the level of always, often, sometimes, seldom and never. The self-management ability of patients with PICC catheter can be divided into different grades according to the score. The score above 144 is better, the score between 108 and 144 is moderate, and the score below 108 is poor. The higher the score, the better the patient's self-management ability.

### **1.2.1.3 Social support scale**

Items 1-4 and 8-10 in the scale are single choices. The scores of the four options A, B, C and D are 1, 2, 3 and 4, respectively. The scores of the four options in the 5 questions ranged from none to full support. The score is 0 for questions 6 and 7 "without any source". The following sources are scored according to the number of sources. The total score is calculated according to the sum of the scores of all items. 2, 6 and 7 are objective support scores, 1, 3, 4 and 5 are subjective support scores, and 8, 9 and 10 are support utilization. Those with a total score of  $\leq 22$  are rated as a low level, those with a total score of 23-44 are rated as a medium level, and those with a total score of 45-66 are rated as a high level. The higher the score, the higher the patient's social support. The reliability and validity of the scale are verified to meet the measurement requirements, and the Cronbach's  $\alpha$  coefficient is 0.896.

### **1.2.2 Data collection methods**

Before carrying out the questionnaire survey, the investigators should be trained on the knowledge of self-management ability, so that they can fully grasp the purpose of the research, and have a certain knowledge of PICC management, maintenance and other related aspects. After the training, the investigators will be systematically assessed, and the corresponding tasks will be arranged after the assessment is passed. The selected subjects carry out a face-to-face survey to ensure the unity of the work progress of all investigators and the degree of specialization of the investigation, on the basis of which a comprehensive survey is carried out. During the on-the-spot investigation, the investigators need to examine the questionnaires filled out by the investigators one by one, and correct them in a timely manner if they are found to be misfilled or omitted. Pay attention to the order of the scene to ensure the final quality of the questionnaire.

## **1.3. Statistical method**

SPSS19.0 version of the statistical software is used for all the data. The questionnaire data are expressed by counting data (n/%) and measurement data ( $\bar{x} \pm s$ ). The differences between the data are examined and compared by  $\chi^2$  and t test. The comparison result  $P < 0.05$  indicates that the difference is statistically significant.

## **2 Results**

### **2.1 General patient information**

The specific demographic characteristics of 240 patients with PICC catheter in this survey are shown in Table 1.

### **2.2 Influencing factors on self-management ability of patients with PICC catheter**

#### **2.2.1 Single factor analysis**

According to the analysis of patients' demographic sociology-related factors, patients' age, education level, long-term caregivers, monthly per capita income, payment methods, religious beliefs, professional nature and other factors are directly related to patients' self-ability. The internal difference is statistically significant ( $P < 0.01$ ). See Table 2.

#### **2.2.2. Analysis on the status quo of social support for patients with PICC catheter**

The statistical results indicate that the total score of social support in patients with PICC catheter is ( $42.27 \pm 10.44$ ), and the scores of objective support, subjective support and utilization of support are ( $12.09 \pm 9.14$ ), ( $24.37 \pm 11.22$ ), ( $6.92 \pm 8.12$ ), respectively.

#### **2.2.3. Influence of social support on the self-management ability of patients with PICC catheter**

The correlation between social support score and self-management score is analyzed in Table 3. The statistical results showed that the total score of social support is positively correlated with the score of self-management ability and the scores of daily catheter observation, abnormal situation management, information acquisition and catheter management confidence ( $P < 0.05$ ). There are different degrees of correlation between the scores of each dimension of social support and the score of self-management ability.

## **2.3. Multi-factor analysis on self-management ability of patients with PICC catheter**

The results of multivariate analysis imply that education level, long-term care, age, monthly per capita income, payment method, religious belief, occupational nature and social support are all influencing factors of self-management ability of patients with PICC catheter. The patients with high education, low age, non-self-expense, long-term caregivers, higher monthly income, higher scores of mental work, religious belief and social support had stronger self-management ability. See Table 4.

## **3 Discussion**

A summary of previous studies on PICC's self-management ability is shown in Table 5.

### **3.1.1 The younger the age, the better the PICC self-management ability**

The effect of age on self-management ability has also been verified in patients with other diseases.<sup>[7]</sup> The older the patients are, the worse the ability of self-management is. This is because with the increase of age, the learning ability of patients decreases and their physical function becomes worse, which affects their mastery of self-management-related knowledge and skills.<sup>[8]</sup> In this work, the score of patients' self-management ability decreased with the increase of age, and is in a stable state after the age of 50. The weakening of this ability is directly related to age. In the process of health education for patients with PICC catheter, nurses should formulate differentiated programs according to different ages to improve the ability of the elderly to understand the relevant information.

### **3.2.2 The higher the level of education, the better the PICC self-management ability**

The results implicit that there is a positive correlation between education level and self-management ability of patients with PICC catheter( $P<0.01$ ). The reasons are as follows: first of all, patients with higher educational level have stronger ability to learn and understand, and will deeply realize the importance of good self-management behavior in the whole process of treatment. when you find your own problems are abnormal, you can take timely and positive measures, so as to reduce the incidence of complications.<sup>[9]</sup>

Secondly, patients with a relatively high level of education can learn the relevant knowledge of PICC catheterization through a variety of ways, rather than simply through the path of "hospitals and nurses". This multi-way knowledge acquisition way helps to expand the scope of knowledge acquisition. From the results of the survey, nurses should pay special attention to those patients with relatively low level of

education in education, and use a variety of ways to improve their understanding of relevant knowledge and deepen patients' understanding of knowledge. [8]

### **3.2.3 With long-term caregivers, PICC self-management ability is relatively better**

The existence of long-term caregivers had a significant impact on patients' self-management ability, and there is a positive correlation between them ( $P < 0.01$ ). An experienced and qualified long-term caregiver is of great significance to patients. [10], because caregivers will strictly supervise the behavior of patients, this strengthens the maintenance of patients' PICC catheters. For those patients with mobility difficulties, the meticulous assistance provided by caregivers will significantly enhance the patients' self-confidence and self-management ability. Therefore, the existence of long-term caregivers has created a positive effect on improving patients' self-management behavior and compliance. Therefore, for those patients who do not have long-term caregivers, under the premise of strengthening their health education, more family members should be encouraged to participate and help patients manage the catheter. In addition, nurses also need to strengthen the follow-up and follow-up of such patients to ensure that there is a close relationship with patients, keep abreast of the actual situation of patients and provide routine care for patients.

### **3.2.4 The higher the monthly income per capita, the better the PICC self-management ability**

There are also some differences in the self-management ability of patients with different income ( $P < 0.01$ ). The self-management ability of patients improved with the increase of income. For low-income groups, they are usually unable to afford the follow-up maintenance costs of PICC tube placement, which directly results in the low self-management ability of PICC tube placement in this part of the population. Specifically, patients with higher income usually have higher cultural literacy, they can fully master the methods of catheter maintenance; secondly, the level of income will also have a certain impact on the mental state of patients. For those patients with relatively high income, they are usually more optimistic and positive, have a strong health responsibility, but also have a higher economic base, which is conducive to patients to choose healthier forms and self-management activities. In Maslow's theory of demand, high-income people have better self-management behavior and a higher quality of life. Patients with better economic conditions can obtain effective information more quickly and achieve higher-level pursuit while meeting their daily needs. [9]

### **3.2.5 Payment method is an important factor that affects the scores of patients' self-management ability**

It is reported that for patients who pay at their own expense or have low-grade insurance, or who have no reimbursement or relatively small amount of reimbursement, they usually do not pay attention to the self-care of the catheter in order to reduce the financial burden. The score of self-management ability of patients who adopt the payment method of medical insurance is higher than that of new farmers' cooperation. <sup>[11]</sup> The main reason is that the patients who pay for health insurance usually live in cities and towns, and the reimbursement proportion is relatively high, while the NCMS patients mainly live in rural areas and the reimbursement proportion is low. This difference in cost leads to the relatively low score of self-management ability of many NCMS patients, which may be directly related to their relatively poor economic conditions and low level of education. The difference in the form of payment will also lead to differences in patients' self-management ability, for patients with self-expense or NCMS insurance, the amount of reimbursement is less, or there is no reimbursement. As a result, they spend little energy on catheter maintenance in order to reduce positive stress, which eventually leads to complications.

### **3.6 Place of residence affects self-management ability of patients with PICC catheter**

Previous studies have shown that residence is one of the important factors affecting the self-management ability of tumor patients with PICC <sup>[12]</sup>. Patients living in different areas have certain differences in PICC self-management ability ( $P < 0.01$ ). The self-management ability of patients living in rural and urban areas is lower than that of patients living in urban areas, among which patients living in rural areas have the worst self-care ability, and patients living in urban areas have the highest score. This is directly related to the regionalization of medical resources in China. A large number of high-quality treatment resources are concentrated in the urban area, and patients enjoy relatively good economic conditions, so it is easier for them to obtain the information of PICC catheterization and to maintain the catheter.

### **3.7 PICC patients with religious beliefs can have stronger self-management.**

Compared with patients without religious belief, patients with religious belief have stronger self-management ability, which proves that mental health has a certain impact on physical health. Patients who believe in religion usually have a more positive mental state. Religion not only supports their spirit, but also enables them to face it more tenaciously and gain the courage to live in the face of illness and pain, which contributes to the faster recovery of the disease.

### **3.8 Occupational nature affects the self-management ability of patients with PICC catheter**

The results suggest that the self-management ability of PICC catheterization is relatively weak in patients with manual labor as an occupation, while the score of self-management ability in patients with mental work is higher. The reason for the difference in the score of self-management ability between the patients of two different occupations is that manual workers lack the necessary understanding of catheter maintenance and management, because their cultural quality is usually lower than that of mental workers. Secondly, there is a lack of protective measures for the work of manual workers. This makes it difficult for them to implement their daily self-management. To make matters worse, manual workers should often do some physical activities, which is prone to the problem of returning blood to the catheter. If it is not treated in time, the catheter will be blocked. In addition, sweat impregnation of manual workers will often cause crimping and shedding of the film, and the return of blood from the catheter and the shedding of the film will easily lead to complications if they are not effectively dealt with<sup>[10]</sup>. This also explains why manual workers have a higher frequency of daily self-management and observation than mental workers. This indirectly implies that nurses should focus on explaining the activity of the arm on the side of catheterization to patients in the process of education, pay attention to teaching patients how to observe catheters, guide patients to find complications in time, and take effective measures to deal with them.

### **3.9 There is a positive correlation between social support and healthy behaviors**

Social support refers to the material and spiritual support and help given by others or organizations, or the degree of individual utilization of social support, which includes three different dimensions: objective support, subjective support and support utilization. Studies have shown that the social support scores of patients with PICC catheter are in the middle level. The total score of social support is positively correlated with patients' self-management ability, catheter observation, abnormal situation management, information acquisition and catheter management information ( $P < 0.05$ ). Objective support is positively correlated with self-management ability, catheter observation and abnormal situation management ( $P < 0.05$ ). There is a positive correlation between subjective support and self-management ability, catheter observation, abnormal situation management and information acquisition ( $P < 0.05$ ). Support utilization is positively correlated with self-management ability, catheter observation, abnormal situation management, information acquisition and catheter management information ( $P < 0.05$ ). Studies have confirmed that social support can have an impact on individual self-esteem and encourage individuals to adopt healthier behaviors.<sup>[13]</sup> Social support promotes patients to build healthy behavior, improve patients' compliance with treatment, and then improve patients' quality of life, which is positively related to healthy behavior.

## **4 Conclusion**

(1) At present, the overall level of self-management ability of patients with PICC catheter is medium, especially the ability of information acquisition and daily catheter observation need to be improved.

(2) Factors such as age, education level, long-term caregivers, monthly per capita income, payment method, religious belief, occupational nature and social support have a direct impact on the self-management ability of patients with PICC catheter.

## **5 Limitations And Further Research**

In this study, the convenient sampling method is adopted because of the limitation of time and conditions, the sample of the study is only selected from a Grade-A hospital in Taizhou city, the representativeness of the sample is limited, and the scope of investigation and research is limited. Therefore, the follow-up study should expand the sample selection area and increase the sample size to enable the results more representative.

## **Declarations**

### **Authors' contributions**

L.C and G.W concepted and designed the manuscript; X. Z, W.X. and X.C contributed to the acquisition, analysis, or interpretation of data; Y.X and L.C contributed to the statistical analysis; L.C and G.W drafted the manuscript; All authors contributed to the critical revision of the manuscript for important intellectual content; T-H.T supervised the manuscript; And all authors have read and agreed to the published version of the manuscript.

### **Competing interests**

Li-Guang Chen, Gang Wang, Xin-Xin Zhang, Wei-Jiao Xu, Xiao-Dan Chen, Ying Xu, and Tao-Hsin Tung declare that they have no conflict of interest.

### **Ethics approval**

The study design was approved by the appropriate ethics review board.

### **Consent to participate**

All study participants provided informed consent.

### **Data Availability statement**

Not applicable

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## Tables

**Table 1**

**Demographic characteristics of patients (n=240)**

Variable		N(%)
Gender	male	129(53.75)
	female	111(46.25)
Age	≤40	48(20.00)
	41-50	42(17.50)
	51-60	81(33.75)
	61-80	69(28.75)
Level of education	Primary school and below	66(27.50)
	Junior high school	87(36.25)
	High school	54(22.50)
	University and above	33(13.75)
Long term caregiver	yes	222(92.50)
	no	18(7.50)
Tubing duration (month)	≤3	93(38.75)
	3-6	81(33.75)
	6-12	63(26.25)
	≥12	3(1.25)
Monthly Per Capita Income (Yuan)	≤2000	21(8.75)
	2001-4000	102(42.50)
	4001-6000	81(33.75)
	≥6001	36(15.00)
Insurance	yes	177(95)
	no	12(5.00)
To live	rural	84(35.00)
	Cities and towns	90(37.50)
	The city	66(27.50)
Insurance	yes	108(45.00)
	no	132(55.00)
profession	Mental work	115(43.75)

**Table 2**

**Single factor analysis on self-management ability of patients with PICC catheter (n=240,  $\bar{x}\pm s$ )**

Variable	N	Mean ±SD	F/t Value	P Value
Gender			1.392	0.173
male	43	141.22±16.93		
female	37	134.23±15.92		
age			28.321	0.01
≤40	16	162.38±10.21		
41-50	14	143.22±11.74		
51-60	27	130.55±18.32		
61-80	23	128.42±12.31		
Level of education			24.327	0.01
Primary school and below	22	119.89±17.32		
Junior high school	29	137.22±11.74		
High school	18	141.68±18.99		
University and above	11	160.11±15.32		
Long term caregiver			4.362	0.01
yes	74	143.72±9.35		
no	6	103.24±10.41		
Tubing duration (month)			1.329	0.273
≤3	31	145.29±16.37		
3-6	27	131.24±18.33		
6-12	21	136.96±9.83		
≥12	1	133.27±10.38		
monthly Per Capita Income (Yuan)			13.121	0.01
≤2000	7	109.08±14.25		
2001-4000	27	139.21±11.28		
4001-6000	34	143.57±9.82		
≥6001	12	144.63±10.22		
Insurance			11.235	0.01
yes	76	150.01±14.33		

no	4	123.66±18.93		
To live			1.926	0.165
rural	28	132.37±14.56		
Cities and towns	30	134.37±13.94		
The city	22	134.28±12.44		
Religious beliefs			6.042	0.01
yes	36	136.75±8.94		
no	44	118.36±10.58		
profession			13.859	0.01
Mental work	21	156.29±10.64		
Manual labor	45	128.33±10.92		

**Table 3**

**Social support scores and correlations of patients with PICC catheter (n=240)**

	Total social support score	Objective support	Subjective support	Support utilization
Self-management ability	0.212*	0.163*	0.187*	0.257*
Take charge of daily life management	0.072	0.088	0.021	0.063
Tube sports management	0.051	0.062	0.048	0.010
Maintain compliance management	0.102	0.073	0.117	0.031
Daily catheter view	0.219*	0.165*	0.147*	0.279*
Exceptional situation handling	0.244*	0.273*	0.229*	0.231*
Access to information	0.273*	0.116	0.317*	0.233*
Confidence in catheter management	0.192*	0.128	0.093	0.229*

Note: \*P<0.05.

**Table 4**

**Multi-factor analysis on self-management ability of patients with PICC catheter (n=240)**

Variable	B value	Standard error	t value	P value
Constant	132.507	9.835	10.867	<0.001
Education	4.756	1.428	3.227	0.001
Long-term caregiver	14.693	4.862	3.428	0.001
Age	-6.203	1.168	-4.725	<0.001
Monthly income per capita	5.194	1.369	3.471	0.001
Payment methods	-2.693	1.287	-2.288	0.018
Religious belief	10.672	3.926	3.221	0.002
Occupational nature	-5.623	1.632	-3.177	0.001
social support	2.381	1.362	4.103	0.001

Table 5

Basic information of literatures

Author	Study year	Country	Study design	Sample size	The research conclusion
Yujiao·Dong <sup>[11]</sup>	2018	China	Variable questionnaire survey	93	The self-management ability of PICC needs to be improved, and it is affected by many factors
Qin·Wang <sup>[8]</sup>	2018	China	Variable questionnaire survey	120	The self-management ability of PICC patients is related to age and education level.
Jie·Chen	2018	China	Variable questionnaire survey		We noted that KAP status toward the daily management of PICC in critically ill cancer patients discharged from intensive care units is not optimistic and needs to be further improved. Attention should be paid to the health education patterns of KAP, and individualized instruction should be pursued.
Ping·Zhu <sup>[12]</sup>	2015	China	Variable questionnaire survey	160	For patients with lower education level, older age and living in rural areas, nursing intervention should be given to improve the self-care ability of tumor patients, so as to improve the PICC self-management ability of patients.
Yumei·Tang <sup>[10]</sup>	2015	China	Variable questionnaire survey	98	Patients with PICC have a high acceptance of the catheter, and they attach importance to self-management during the period of carrying the catheter