

# The significance of PICC nursing health education on the healthy development of breast cancer patients and its application effects

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## Abstract

**Aim:** Breast cancer is the most prevalent disease affecting human life nowadays, and its global morbidity and mortality are increasing annually. Nowadays, peripherally inserted central catheter (PICC) technology has been recognized by the majority of medical workers and widely employed in clinical departments of hospitals at all levels, but there is a need for wide study on PICC technology. Therefore, this study was conducted to evaluate the significance of PICC nursing health education on the healthy development of breast cancer patients and its application effects. This study was conducted to elucidate the impact and application of nursing interventions based on the intelligent grip strength system in patients with tumor peripherally inserted central catheters (PICC) on promoting functional exercise and quality of life.

**Objective:** To examine the catheter maintenance compliance, psychological well-being, and lack of PICC maintenance for breast cancer patients.

**Methods:** 128 men and women aged 20 - 85 years with malignant tumours who received PICC line maintenance from November 2019 to March 2020 were included in the research cohort. In this research, only patients who had a PICC placement for less than two weeks, with a malignant tumour and who were less than 20 years old were included in this study. Patients who were able to complete the questionnaires on their own or with assistance were also included. Two equal groups were formed, group C (control) and group S (study). HPLP-II was used to categorize the patients. Catheter maintenance compliance, psychological well-being, and lack of PICC maintenance were examined the factors examined in this study.

**Results:** Group C and Group S were statistically indistinguishable in terms of demographic characteristics such as gender, age, education, location, and family income ( $p>0.05$ ). This research found that there were significant differences between the high and moderate level groups in terms of education and other factors, such as family income and length of catheterization ( $p<0.05$ ). Immediately after the intervention, both the HPLP-II and CPPSM scores were enhanced, and both scales' scores in the intervention group were greater than in the control group ( $p<0.05$ ). Patient education has been found to substantially reduce patients' anxiety and sadness throughout therapy, as shown by lowered SAS and SDS scale ratings in both groups following the intervention ( $p<0.05$ ). According to the results ( $p<0.05$ ), patient education may improve catheter maintenance and compliance in the study group (as opposed to the control group).

Patient education has the potential to greatly decrease PICC maintenance failures, as indicated in Table 5 ( $p<0.05$ ), which indicates that 10% of study participants had PICC failures compared to 22% of the control group. The rate of problems during placement in the study group was considerably lower as compared to the control group ( $p<0.05$ ), demonstrating that patient education may greatly minimize the frequency of difficulties during placement.

**Conclusion:** In this study, it was observed that patient education may increase healthy behavior and self-management skills as well as prevent problems, relieve negative feelings, and improve compliance. [*Ethiop. J. Health Dev.* 2022; 36(3) 00-00]

**Keywords:** cancer patients, PICC, health-promoting behaviors, health education

## Introduction

According to the World Health Organization's 2020 projections, cancer claimed the lives of 9 million people in 2016(1). The worldwide morbidity and mortality rates associated with malignant tumours are increasing annually, making this illness the most frequent threat to human life today (2). Tumours are often treated using chemotherapy. To administer traditional medication such as chemotherapy, patients must have a local puncture of their peripheral venous system. For example, repeated punctures of the vascular wall may lead to hyperplasia and fibrosis of the vascular wall, resulting in sclerosis and stenosis at the site of puncture (3).

Procedures such as PICC catheterization use peripheral veins, such as the superior vena cava, anterior cephalic vein, and middle vena, to insert the

catheter tip into the superior vena cava or subclavicular artery. As a result of these features, the medicine is kept away from smaller peripheral veins, where venous blood flows more slowly. To the greatest degree possible, it can prevent drug stimulation on the skin and blood vessels surrounding the puncture, reducing the likelihood of problems, avoiding locally repeated punctures, and being appropriate to use for long-term drug treatment (4,5).

Modern oncology relies heavily on the ability to access a central vein over a lengthy period for the administration of chemotherapy and the collection of blood samples.

Peripheral inserted central catheter (PICC) technology has gained widespread acceptance among medical professionals in recent years, owing

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to ongoing clinical research and investigation (6). Recently, PICCs have become more popular as an alternative to conventional ports. For a variety of reasons, such as costs, purported safety, and the convenience of insertion by outside nursing teams, PICC is the preferred choice of treatment. In the event of an infection or thrombosis, many oncologists prefer PICCs since they may be readily withdrawn for source control. Patients who are neutro- or thrombocytopenic after treatment are especially at risk (7).

Furthermore, since this therapy is an invasive procedure, it has certain hazards, such as incorrect nursing care and an easy development of deep vein thrombosis in the latter stages, which not only affects the health of patients but also has an impact on their families' finances.

Trans-peripheral central venous catheters (PICC) are a safe and reliable intravenous chemotherapy channel for malignant tumor patients, enabling the direct infusion of chemotherapy drugs into the vein. PICC has the advantages of easy operation, long-term use, and a high puncture success rate, and it helps to avoid vascular damage due to irritant agents.

The major goals of infusion nursing care are as follows:

**Administration of intravenous fluid, drug infusions or blood products**

- a. **Continuous infusion of IV fluids**  
Assessment and documentation of findings are to be completed hourly to determine the effective delivery of prescribed medications and fluid.
- b. **Infusion Pump Pressure**  
Pressure limits defaults for intravascular infusion pumps are programmed by Biomedical Engineering, based on the manufacturer's recommendations.
- c. **Administration of bolus/loading doses:**

**Drug Administration**

The most appropriate method selected depending on the volume of diluent required, patient condition, fluid balance, and intended rate of delivery, as well as a completed drug label detailing the drug, dose, diluent, volume of **Change of PIVC dressing and securement of cannula**

PIVC dressings are the first line of defense against infection and dislodging. The dressing must be maintained safe, clean, dry, and intact at all times.

When the dressing becomes unstable or there is blood or fluid leakage under the dressing, it is time to replace it.

Determine the requirement for an assistant before the surgery, taking into account the patient's age, developmental level, and family participation.

Catheter-related complications are the main factors affecting the duration of peripherally inserted central catheters (PICC). According to the study, the incidence of catheter-related complications is about 20% to 35%. Complications can occur at any time during the period of PICC catheterization, and the most common complication is deep venous thrombosis of the upper limb (8-9). Catheter-related thrombosis (CRT) refers to the process of forming blood clots on the inner wall of the blood vessel or catheter due to mechanical damage employed by catheter puncture, chemical damage employed by drug stimulation, and the state of the patient after the insertion of the PICC catheter. Catheter-related DVT leads to an increase in mortality in patients. Phlebitis, catheter blockage, and blood extravasation at the puncture site are the most frequent consequences; however allergic reactions and thrombosis are other possible concerns.

Since this treatment is an invasive operation, there are also certain risks in its implementation, such as improper nursing care and easy formation of deep vein thrombosis in the later stage, which not only affects the health of patients but also causes a specific economic burden on their families. Therefore, it is essential to supplement these treatments with the necessary nursing interventions.

diluent, date, time, and signature of the nurse or staff, were noted.

**Administering blood products**

In compliance with the Blood Product Transfusion Procedure, the patient and blood product identification were checked. To ensure proper administration, administer blood product transfusions with a volumetric infusion pump or syringe driver.

**Flushing of PIVC's**

According to the literature, the amount of flush should be at least twice the volume of the catheter and add-on devices. The cannula is used intermittently for drug or fluid administration, it should be flushed prior to infusion or at least once every shift. Before accessing the system, use aseptic non-touch techniques such as extensively cleaning the access port (scrubbing the hub) with a dual disinfection agent (e.g., chlorhexidine and alcohol) for at least 15 seconds and allowing to dry.

If the patient is allergic to transparent film dressings, use sterile film dressings that are changed on a regular basis.

Remove the old dressing with care, maintaining the cannula in place at all times. Check cannula's entrance site for any symptoms of infection.

For dressings, the ideal option is skin preparation with 2% chlorhexidine in alcohol.

Clean the region around the catheter insertion site, including under the hub, with a pattern that covers the whole area.

Allow the skin preparation to dry before applying any dressing; this enables the disinfectant to do its job. To relieve pressure, place a tiny piece of sterile cotton wool or gauze beneath the hub of the cannula.

### Change of Extension sets

Extension sets must be updated whenever the access device is changed or when contamination or a break in integrity is detected. At the time of IV insertion, extension sets should be primed and joined to the cannula using an aseptic non-touch method. When flushing extension sets, a positive pressure clamping technique must be used. Extension sets must be clamped while not in use.

### IV Fluid Considerations via Peripheral IV line

Fluids with glucose contents more than 12.5% will necessitate central venous line access.

### Labelling infusions

The fluid bag or syringe with the date, time, patient name, and the signatures of two checking personnel were recorded. The label is applied to the front of the fluid bag, making sure that the fluid name, batch number, expiration date, and graduations are visible

**Removal of PIVCs:** There is no evidence for routine replacement of PIVC unless clinically indicated. PIVC's should be maintained using regular assessments and through the documentation of complications. The possible reasons for removal of PIVC's include several complications which

### Management of complications

There are a range of complications that could occur with the presence of a PIVC in site. Some of these complications can be prevented through the correct use of aseptic techniques used for the insertion and maintenance as well as for assessing the device as indicated

### Common complications include:

#### Infections:

Skin-based bacteria may enter through the insertion site

Local cellulitis or systemic bacteria may develop.

#### Phlebitis: Vein irritation

Due to the presence of the catheter/fluids or medication

Chronically ill patients may require multiple and recurrent IV access.

**Infiltration/Extravasation:** delivery of fluids or medications into surrounding tissue.

### Cumulative Complexity Model

*The model emphasizes a core, patient-level mechanism whereby complicating factors impact care and outcomes:* the balance between the workload of patient demands and the patient's capacity to address these demands. Workload encompasses the demands on the patient's time and

Before applying the clear dressing, cover the hub of the device with sterile tape if desired.

Documentation must include information on the insertion site, needle gauge, and the date and time of insertion, as specified in the EMR- LDA attributes. (link to national standard). Syringe labels are placed parallel to the long axis of the syringe barrel, with the top edge flush with (but not obscuring) the graduations. Label the IV line at the fluid bag or syringe or below the drip chamber if there are several lines flowing. Identified the bag or syringe driver with "additives added" if additives are introduced to the infusion.

### Fluid bag and infusion changes

The Fluid bags and syringes were changed every 7 days. Every 24 hours, fluid bags and additive infusions were replaced. At the end of the infusion or at least every 24 hours, fresh blood products and lipid-containing solutions—both the bag, syringe, providing set, and lines—should be withdrawn or replaced.

### Line changes

Standard aseptic methods were used to change infusion lines at least every 7 days. Administration sets that have been detached destroyed. Replace the line(s) at the conclusion of the infusion if using fresh blood products.

range from infiltration, extravasation, phlebitis, occlusion, dislodgement, and migration. Once the child's treatment is over, the PIVC should be removed to avoid any additional complications.

energy, including demands of treatment, self-care, and life in general. Capacity deals with the ability to handle work (e.g., functional morbidity, financial/social resources, literacy). Workload-capacity imbalances comprise the mechanism driving patient complexity. Treatment and illness related complications serve as feedback loops,

linking negative outcomes to further imbalances, which imply that complexity may accumulate over time.

To ensure that the patient's venous circulation may be securely accessed, healthcare practitioners employ peripherally inserted central catheters (PICCs) for infusion treatment (10).

When inserted the PICC can provide huge amounts of fluid and drugs into major veins with little danger of causing discomfort or harm to the vascular wall. Parenteral nutrition, antibiotics, and analgesics, as well as chemotherapy and frequent blood transfusions, are all common reasons for using PICC lines (11).

As a result, it is essential to augment with nursing care. The Oncology Nursing Society (ONS) and the Infusion Nurses' Society both have standards of practice that cover PICC management and patient and family education (INS). Despite its widespread usage in the past, conventional nursing is no longer enough to address patient requirements.

Most patients are released from the hospital as soon as their health stabilizes since prolonged hospitalization might have a negative impact on their mental and financial well-being. When a patient is discharged, the nurse-patient contact is lost. When a patient is released from the hospital, their eating and living habits will have a significant influence on their health (10).

Continuous nursing care for patients with PICC catheterization is essential in order to enhance their quality of life and limit the risk of side effects. Conventional nursing has been used a lot in past clinical practices, however it can no longer meet the needs of patients. Since long-term hospitalization of patients can increase their psychological burden and economic pressure, most of them are discharged once their condition is stable. Once a patient is

released, the nurse-patient relationship ends. Furthermore, the nursing staff will briefly introduce relevant matters for attention, but the patient's eating and living habits after discharge will substantially impact their condition. Continued nursing is mainly performed to extend nursing services from hospitals to patients' families to ensure the continuity and coordination of patients' care and benefits. At present, there are few reports on the application of continued nursing services for patients with tumour chemotherapy utilizing PICC catheterization.

For the most part, continued nursing is used to extend hospital nursing services to patients' families to provide continuity and coordination of the patients' care and benefits (11). As part of the healthcare context, patients and caregivers are educated both individually and, in a group, setting, like in a line-care class. PICC care and short-term home care nursing are included in this round of training. To promote safe and successful self-management, patients and caregivers must learn and demonstrate suitable practices to avoid catheter occlusion and infection. Guidelines for patient and caregiver education are available from the Infusion Nurse Society (INS, 2016). As a result, this research set out to investigate the impact of PICC nursing health education on breast cancer patients' healthy development and its application effect (12-14).

#### **Material and methods**

The Department performed research that was authorized by the Protocol Review Committee and the Institutional Ethics Committee from November 2019 to March 2020. The research cohort included all patients with malignant tumours who had PICC line maintenance at the hospital from November 2019 to March 2020, comprising of 48 men and 52 women, ranging in age from 20 to 85 years of age. The research was conducted after obtaining informed consent from the patients or their relatives after providing them with detailed information about the study.

#### **Criteria for inclusion**

Patients who have had a PICC implantation for less than two weeks.

Patients with malignant tumors under the age of 20; diagnosed using imaging, cytology, and pathological examinations.

Patients who could complete the questionnaires on their own or with assistance.

#### **Exclusion criteria**

Patients who have a concurrent serious underlying medical problem.

Patients with an allergy or a history of severe allergies.

An inability to participate in this study for any other reason is not an exclusionary factor for patients with mental disorders. Because of unhealthy behaviors, adverse metabolic effects of antipsychotics, inadequate access to high-quality physical healthcare.

Patients with perceived barriers to communication or cognitive disorders.

Patients with contraindications to PICC placement.

Patients with coagulation dysfunctions/disorders.

Patients not willing to participate in the study.

#### **Methodology**

Two equal groups of participants were formed, group C (control) and group S (study). HPLP-II was used to categorize the patients and catheter maintenance compliance, psychological well-being,

and a lack of PICC maintenance were examined. The patients were divided into six groups based on their HPLP-II.15 scores using the **HPLP-II.15 component analysis**: health responsibility, interpersonal connections, nutrition, physical activity,

spiritual development, and stress management. Scores of 137 or more were regarded high, while scores of 137 or lower were rated low to moderate. Age, gender, educational level, area of residence, and placement length were all compared between the two groups.

### Method of care

There were two groups of 50 patients each with malignant tumours: one for each of the 100 individuals. Regular care was provided to the control group, including dietary changes, patient education, and assistance with catheter insertion. This was the health education that the study participants received. The patients were advised regarding the extended course of treatment and the necessity for long-term infusions which could be used to minimize the stimulation by chemotherapy chemicals. Lectures were given by previous patients who had been successful in their treatment plans and by trained nursing and medical staff. Drawings, images, and other visual approaches were used to describe the placement procedures and the benefits of PICC, its purpose, and the crucial stages during installation.

For the sake of their mental health, the patients were urged by medical staff to interact with their loved ones. The patients had access to the best possible vascular access options. Anesthesia doses were raised for people with lower tolerance levels for pain. During the surgeries, the doctors listened attentively to each patient's concerns. The replacement of the patch and the application of the dressing were shown and described in detail. These patient's education cards and pamphlets explained the post-placement precautions. WeChat groups and telephonic follow-ups were used to educate patients about the risk factors for difficulties during placement and how to avoid them.

As a guide for patients and their families, educational movies and checklists were utilized to teach them how to properly maintain their PICCs.

### Outcome measurement

**Self-management abilities:** Before and after 3 months of the study, the patients' self-management skills were assessed using the CPPSM16 7 elements, which included catheter management confidence, daily life management, and catheter maintenance compliance. They were divided into three categories: **excellent (>144)**, **intermediate (108-144)**, and **low (108)**

**Psychological status:** The patients' psychological states were examined before the intervention and 3 months later using the Depression Self-assessment Scale (SDS)<sup>17</sup> and the Anxiety Self-assessment Scale (SAS) (18). Overcoming the cut-off scores of 53 and 50 were considered an indication of sadness or anxiety.

**Catheter maintenance compliance:** Full compliance was defined as strict attention to the doctor's instructions and timely flushing, installation, and replacing of PICC catheters. Partial compliance was described as following the doctor's instructions but not properly maintaining the PICC catheter. Non-compliance was defined as failing to follow the doctor's recommendations and failing to maintain the PICC catheter.

**Lack of PICC maintenance:** Some of the factors which constituted to the Lack of PICC maintenance include: the occurrence of a loose dressing at the puncture site without maintenance, fluid leakage and blood at the puncture site without maintenance, using the same sterile gauze dressing for more than two days without maintenance, seven days without flushing, and dressing contamination at the puncture site without maintenance, a comparison was made between the two groups.

**Complications during the placement of the catheter:** During the procedure, problems such as bleeding at the puncture site, phlebitis, catheter obstruction, and catheter dislodgement were noted and compared to the control group.

### Statistical analysis

The data was analysed using the SPSS 25.0 programme. The measurement results were reported as (S) and compared using t-tests to see if they were statistically significant. The percentages of the count data were calculated and compared using a two-tailed t tests. In order to analyze the rank data, a rank sum test was used. A significant difference was indicated by a p-value of less than 0.05.

### Results

The results of the study indicated that there were no significant demographic differences between the groups C and S ( $P>0.05$ ) in terms of gender, age, education, area of residence, family income, etc (Table 1).

**Table 1. Demographic profile**

Demographic profile	Control group	Study group	P value
<b>Age</b>	53.69±95	52.52±39	.278
<b>Gender</b>			
Male	27 (54%)	21(65%)	0.781
Female	23 (46%)	29(65%)	
<b>Education</b>			0.00
Up to 10 <sup>th</sup>	5 (10%)	3 (0%)	0.54
Up to 12 <sup>th</sup>	18 (36%)	20 (16%)	
Graduation	16 (32%)	17 (72%)	

Post-graduation	11 (22%)	10 (12%)	
<b>Family income</b>			
Low	8(16%)	10 (35%)	0.00
Average	35 (70%)	32 (50%)	
High	7 (14%)	8(15%)	
<b>Area of residence</b>			
Rural	20(40%)	19(38%)	
Urban	30(60%)	31(62%)	
<b>Duration of placement</b>			
Below 30	10(20%)	11(22%)	
30-90	32(64%)	29(58%)	
Above 90	8(16%)	10(20%)	

There were substantial differences between the high-level group and the low and moderate level group in terms of education, area of residence, family income, length of catheterization, anxiety, and self-management skills (Table 2).

**Table 2. EHPD in patients with malignant tumors: A with single-factor analysis**

Parameter	Low to moderate level group (n=80)		High level group (n=20)		$\chi^2$	P
<b>Age</b>	50.12±63		51.02±78			0.411
<b>Gender</b>					0.174	0.598
Male	39	48.75	9	45		
Female	41	51.25	11	55	21.652	0.001
<b>Education</b>						
Up to 10 <sup>th</sup>	6	7.5	2	10		
Up to 12 <sup>th</sup>	29	36.25	9	45	14.741	0.003
Graduation	26	32.5	7	35		
Post-graduation	19	23.75	2	10		
<b>Family income</b>					10.115	0.008
Low	15	18.75	3	15		
Average	54	67.5	13	65		
High	11	13.75	4	20	7.526	0.029
<b>Area of residence</b>						
Rural	30	37.5	9	45		
Urban	50	62.5	11	55		
<b>Duration of placement</b>						
Below 30	16	20	5	25		
30-90	51	63.75	10	50		
Above 90	13	16.25	5	25		
<b>Anxiety</b>					5.179	0.017
Yes	27	33.75	4	20		
No	53	66.25	16	80		
<b>Depression</b>					0.542	0.541
Yes	2	2.5	1	5		
No	78	97.5	19	95		
<b>Number of placements</b>					0.213	0.889
1	52	65	12	60		
2	20	25	5	25		

	3	8	10	3	15		
<b>Timing to placement</b>						1.221	0.572
1 <sup>st</sup> chemotherapy	55	68.75	13	65			
2 <sup>nd</sup> chemotherapy	18	22.5	5	25			
3 <sup>rd</sup> chemotherapy	7	8.75	2	10			
<b>Caretaker</b>						0.886	0.636
Spouse	71	88.75	11	55			
Parent or others	9	11.25	9	45			
<b>Self-management skills</b>							0.001
Good	11	13.75	2	10			
Moderate	21	26.25	5	25			
Poor	47	58.75	13	65			

An unconditional logistic regression analysis, displayed in Table 3, uncovered several risk factors for patients with malignant tumours participating in self-health promotion behaviors during PICC line

maintenance, including education, residence, family income, length of catheterization, anxiety, and the ability to manage one's own health.

**Table 3. EHPD in patients with malignant tumors: A multifactorial analysis**

Parameter	OR	95% CI
<b>Education</b>	21.120	3.999-69.785
<b>Area of residence</b>	5.982	1.758-20.257
<b>Family income</b>	3.426	0.879-10.554
<b>Duration of placement</b>	3.984	1.452-11.557
<b>Self-management abilities</b>	2.226	1.021-2.961
<b>Anxiety</b>	4.697	1.772-8.888

Study group catheter maintenance compliance was significantly better than that of the control group (P 0.05), displayed in Table 4, suggesting that the patient's education may improve catheter maintenance compliance.

**Table 4. catheter maintenance compliance between Group C and Group S**

	Control group	%	Study group	%	P value
<b>Complete compliance</b>	16	32	32	64	0.0001
<b>Partial compliance</b>	24	48	16	32	
<b>Non-compliance</b>	10	20	2	4	

Patient education has the potential to greatly decrease PICC maintenance failure, as displayed in Table 5 (P 0.05), which indicates that 10% of study

participants had PICC failures as compared to 22% of the control group (Table 5).

**Table 5. lack of PICC maintenance between the Group C (control) and Group S (study)**

	Control group	%	Study group	%	P value	$\chi^2$
Dressing contamination at puncture site	2	4	1	2	0.551	0.339
Sterile gauze dressing over 2 days	3	6	2	4	0.365	0.645

Oozing and bleeding at puncture site	3	6	1	2	0.159	1.786
Loose dressing at puncture site	2	4	1	2	0.331	1.022
Not flushed for more than 7 days	1	2	0	0	0.581	1.016

**Note: compared with the control group, \*P<0.05.**

**Table 6:** Patients who received patient education had a lower rate of complications after placements (12%) as compared to those who did not,

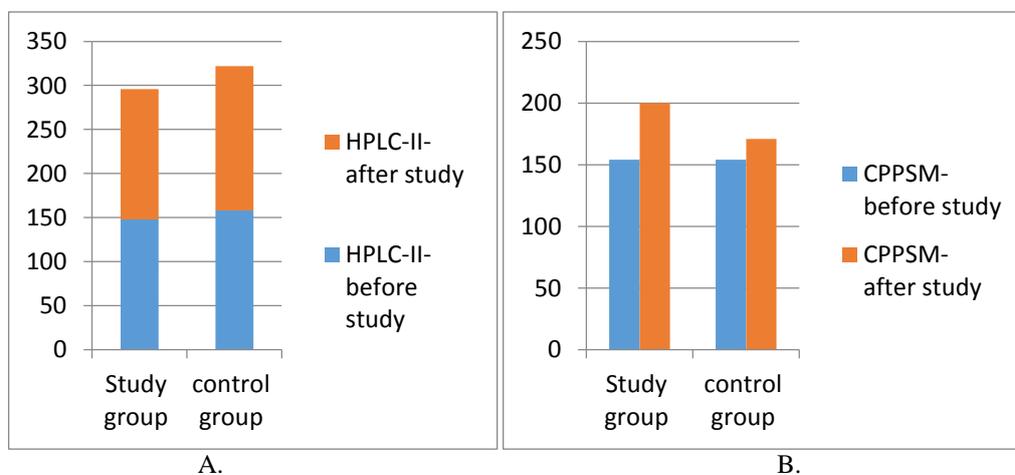
demonstrating that patient education may considerably decrease the incidence of difficulties during placements (P 0.05).

**Table 6. The rate of complication during the placement a comparison in between group c and group s**

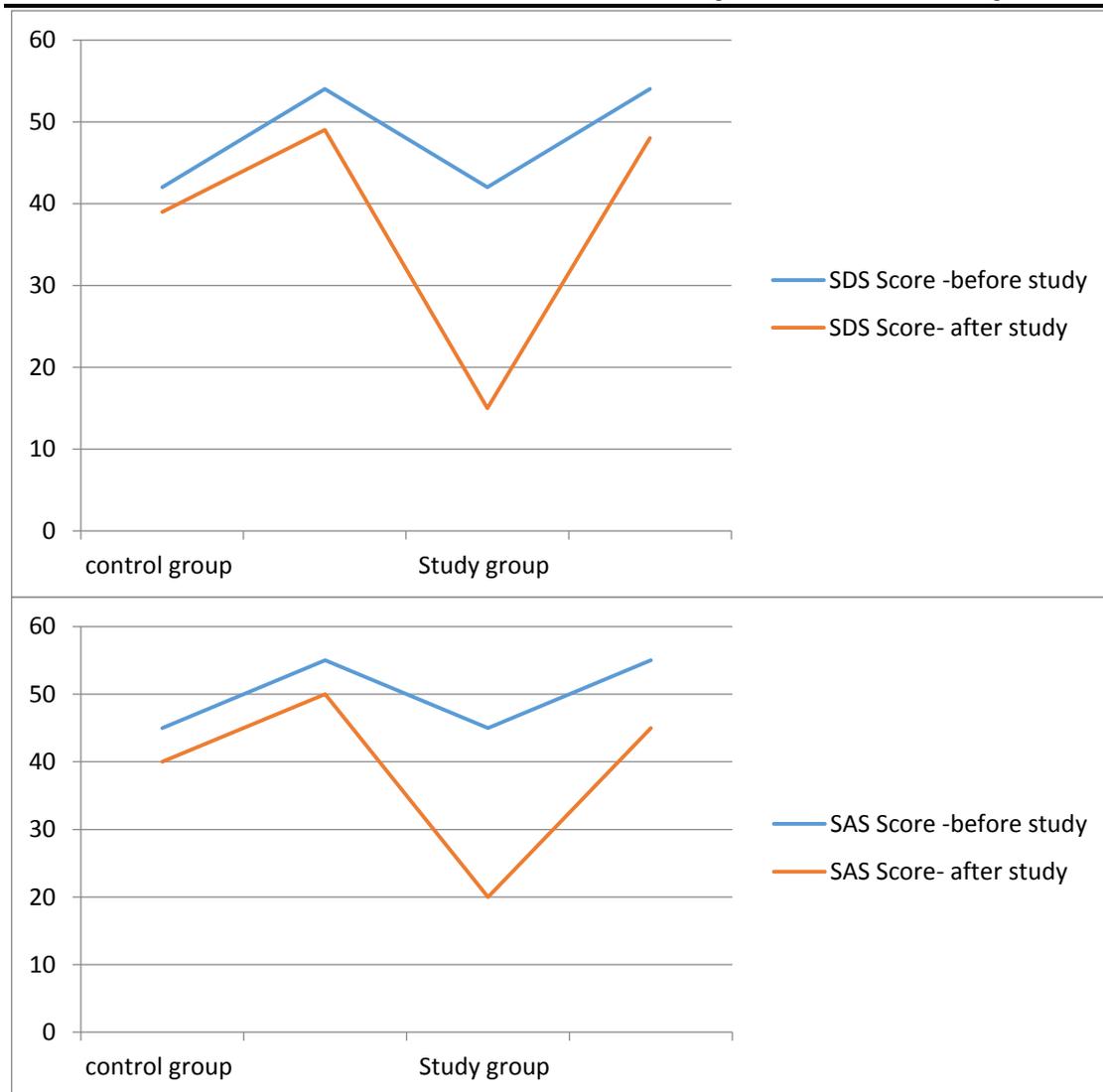
	Control group	%	Study group	%	P value	$\chi^2$
Dislodgement	2	4	1	2	0.115	1.011
Clogged catheter	3	6	1	2	0.315	1.745
Bleeding	2	4	0	0	0.162	2.336
Phlebitis	4	8	2	4	0.391	0.854
Allergic dermatitis	3	6	2	4	0.587	0.365

**Fig 1** indicates that the HPLP-II and CPPSM scores increased dramatically, and these scores were significantly higher in the study group than in the control group (P 0.05). Between the study and

control groups, there was a significant decline in SAS and SDS scale scores (P 0.05), demonstrating that patient education may lower patients' anxiety and depression during therapy (Fig 2).



**Fig 1. A comparison of the HPLP-II and CPPSM scale scores in the two groups. Note: (A) HPLP-II scores; (B) CPPSM scores.**



**Fig 2a. SDS score comparison for the two groups**

**Fig 2b. SAS score comparison for the two groups.**

## Discussion

As a method for long-term chemotherapy injections, PICC has significant benefits, including a simple operation, less traumatic use, and long-term use.

When a patient has catheterization, they will experience varying levels of stress and psychological illnesses, which may have an unfavorable influence on the catheterization's effectiveness (19,20). To create targeted treatments which can be used to increase their self-care skills, improve their compliance, and minimize their complications, it is necessary to investigate the variables influencing the involvement of self-health-promoting activities during PICC maintenance.

Study participants had an average score of (100.70 18.42) for a health-promoting lifestyle, which was typically at a medium level, according to Wen et al

(21). The scores were correlated with education levels and the number of days of catheterization.

Self-health-promoting activities during PICC maintenance were shown to be impacted by characteristics such as educational level, area of residence, family income, and the length of catheter implantation in this study, which is consistent with findings from the previous research.

### The reasons are as follows:

#### Education

Patients with higher education levels may actively seek important medical information, fully comprehend the value, and need of PICC implantation, and execute catheter care according to the educational materials, which is favorable to the establishment of a health-promoting lifestyle.

**Area of residence**

Poor mobility and the lack of medical services in rural locations led to a lack of catheter maintenance compliance among rural patients, resulting in lower compliance rates (22).

**Placement durations**

Patients who stayed in the hospital for a longer period had better self-management skills, which may be due to the amount of teaching and supervision they received. When it came to developing healthy habits, self-management skills and psychological states played a significant role. This enabled patients to establish confidence and reduced the detrimental influence of negative emotions associated with their condition (23).

Society can be an important source of support for patients during rehabilitation by providing them with relevant health-related information and resources, and by reducing their resistance to treatment and rehabilitation, which in turn encourages patients to develop self-health-promoting behavior (24).

Study participants in this study had higher HPLP-ii and CPPSM scale scores, lower SAS and SDS scores, and a better catheter maintenance compliance rate than those in the control group, and the study group had fewer incidents of PICC failure and complications, as well as a better compliance rate. As a result, patient education may enhance self-management skills and health-promoting behaviors, minimize negative psychological states, increase catheter care compliance, and reduce the frequency of PICC maintenance failures and their associated complications. Patients with malignant tumors who received health education had better HPLP-II scores and fewer issues than those who received standard care, which supports the idea that health education, may assist patients with PICC maintain healthy behavior and prevent complications. Patients' reluctance to have a catheter installed may have been alleviated by the distribution of educational information regarding PICC procedures, including precautions and strategies that can be used to cope with problems (26). Maintaining catheters improved their quality of life and reduced their risk of developing mental health issues (26).

Wen et al. found that 125 cancer patients with PICC had an average score of  $(100.70 \pm 18.42)$  for health-promoting lifestyles, which was generally at a medium level, and the scores were related to the patients' education levels and the number of days of catheterization. This study found that the engagement of self-health-promoting behaviors during the PICC maintenance was influenced by factors such as educational level, place of residence, monthly household income, and the duration of catheter placements, which was basically like the research findings. PICC maintenance and problems can be reduced and patients who live far from home may save time and money, which can improve their

health-promoting habits and compliance as well (27-30).

**Conclusion**

This research investigated a variety of factors related to the use of self-health-promoting activities in the maintenance of the PICC pipeline in cancer patients. In this study, it was observed that patient education can increase healthy behaviors and self-management skills; minimize problems; relieve negative feelings; and improve compliance. There was an insufficient investigation of sociodemographic profiles, self-management skills, and self-health promotion practices, which may have introduced a form of bias to the findings.

**Practical Implications and Limitations**

This research identified essential factors for the engagement of self-health-promoting behaviours for the PICC pipeline maintenance in malignant tumor patients. Implementing targeted patient education can promote healthy behavior and self-management abilities, reduce complications, alleviate negative emotions, and improve compliance. Although the study analyzed the relationship among the socio-demographic factors, self-management abilities, social support, and the self-health promotion behaviours, the results were inconclusive due to the small sample size, the scope which was relatively narrow, and there was a lack of comparability, which may lead to some bias in the results. All these shortcomings can be improved in future studies.

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