Effect of Implementing Nursing Guidelines on Reducing Late Implanted Portal Catheters Complications among Chemotherapy Patients

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Abstract

Background: A totally implantable venous access device (TIVAD) provides patients with safe, effective, and long-term, convenient venous access (VA) for the administration of chemotherapy drugs (CD) .**Aim:** Evaluate the effect of implementing nursing guidelines (NG) on reducing late implanted portal catheter complications (LIPCC) among chemotherapy patients (CP) at Minia Oncology Center (MOC). **Sampling:** A purposive sampling of 70 adult patients connected to a portal catheter (PC). **Tools:** Two tools were used: **The first tool,** Patient Health Assessment (PHA), included two parts. **First Part:** Patient Demographic Data (PDD) Second **Part:** Patient's Medical Data (PMD). **Second Tool:** Portal Catheter Complications Observation Checklist (PCCOC).. **The first part,** General Assessment (GA), included four main complications. **Second Part:** Grading Scale for Monitoring Extravasation (GSME). **Results** More than half of the intervention group (IG) was female. There was a lower percentage of renal diseases and hypertension among the intervention group. It was noticed that **systematic infection** (SI) was present in **5.71** % of the intervention group while it was present in **8.27**% of the control group (CG). at the first observation, it was noticed that **systematic infection** percent increased among control group at the second and third observation (**48.57** %, **74.28** %) respectively but it decreased among intervention group at second and third observations (11.4%) comparing with control group .It was noticed that there was a highly significant correlation between local infection (LI) and the number of chemotherapy sessions per week among intervention group. **Conclusion:** The current study findings concluded that adhering to nursing guidelines resulted in a lower percentage of late complications (LC) among the intervention group compared to the control group. **Recommendations**: Replication of the current study on a larger probability sample for different geographical locations in order to generalize the results.

Keywords: Nursing Guidelines Implanted Portal Catheters, Late Complications and Chemotherapy Patient

Introduction

Totally implantable venous access devices (TIVAD) are convenient for long-term venous access in patients with cancer and also provide safety until the completion of chemotherapy. TIVAD is used for prolonged administration of systemic cytotoxic drugs, nutritional support, intravenous fluids, blood, and blood products **(Chandveettil et al., 2021).**

Venous port system complications (VPSC) are divided into early (≤30 days after implantation) and late (>30 days) complications. There are two. categories of complications: "minor" and "major." Minor complications are incidents that don't require more surgery, intervention, or medical therapy for longer than a day. On the other hand, serious complications necessitate surgery, lengthy medical therapy, and longer hospital stays. Hemothorax and pneumothorax are the most likely serious side effects. VPS infection has been reported to be the most prevalent late complication, with an overall prevalence of 7.2–12.5%. Late complications included TIVAD-related infection, catheter occlusion, venous thrombosis, wound healing problems, catheter migration, and embolization **(Velioğlu et al., 2019).**

Nursing responsibility to prevent late portal complications by strict adherence to sterile technique during implantation and every subsequent access is seen as the most effective preventive intervention. so nurses should take precautions against infection. When it comes to critical patients, thosewho required central venous access, alcohol or chlorhexidine has been demonstrated to prevent more infections than povidone iodine. To avoid infection, needles used for continuous infusions should be changed at least once every seven days **(Mohamed et al., 2023)**

Significance

According to **(Li et al.2022**) retrospective clinical cohort analysis through 2022, 13.0% of patients (224/1716) had higher percentages of infection complications, which considers the highest incidence of late complications (LC).The recent study conducted by **(Mersal et al., 2019)** in Egypt, about a quarter of patients had systemic or site infections following a fully implanted venous access device. Furthermore, more than ten percent of them had venous thrombosis, tube cutting, and unintentional blood vessel puncturing.

Through my experience as assistant lecturer over a period of 2 years working in Minia oncology center I observed lack in nurses' knowledge and skills regarding implanted portal catheter that led to multiple late complications as systematic infection, local infection, occlusion, leakage at the port and extravasation that affect on patient's conditions, delayed patient out burden hospital resources and endanger patient's life. Therefore, this study will be designed in an attempt to apply nursing guidelines regarding implanted portal catheters to reduce late complications related to it among patient administer chemotherapy

Subjects and Methods

Aim of the Study

The present study aimed to evaluate the effect of implementing nursing guidelines on reducing late implanted portal catheter complications among patients receiving chemotherapy at Minia oncology center .

Research Hypotheses

To fulfill the aim of the study, the following research hypotheses were formulated:-

- H1: Late portal catheters complications will be reduced among intervention group compared with control group.
- H2: There is a correlation between demographic data and reducing late implanted portal catheter complications.
- H3: There is a correlation between medical data and reducing late implanted portal catheter complications**.**

Research Design:

A quasi-experimental research design (intervention – control) was utilized to fulfill the purpose of this study.

Setting

This study was conducted at Minia oncology center in the outpatient chemotherapy and the critical care unit

Subjects

A purposive sample of 70 adult patients who recently connected with a portal catheter was divided equally into two groups (intervention and control), with 35 in each one.

Sample Size:

The formula (Slovin's, 1960) used to calculate the sample

n = N / (1+Ne2); whereas:

n = 84/[1+ (84) (0.05) 2 = 70 patients

Inclusion Criteria:

Patients aged between 18 - 65 years who are willing to participate in the study and have recently been admitted to an MOC for the implantation of a portal catheter to receive chemotherapy via it.

Exclusion Criteria:

Patients had any infections.

Study Duration

Data collection started from "March 2020 to October 2021".

Tools for Data Collection

The researcher developed two tools that were used in the current study. They were established after an extensive literature review and revised for validity.

First Tool: Patient Health Assessment:

First Part: Demographic Data: It involved the patient's code, age, sex, occupation, and educational level.

Second Part: Medical Data: It included the medical diagnosis, date of admission, presence of chronic diseases (e.g., liver diseases, diabetes, renal diseases, and hypertension), and number of chemotherapy sessions per week

Second Tool:

First part : Portal Catheter Infection Complications Observation Checklist

This tool was adapted from (**Matthew Johnson, 2013)** and it is utilized to systematically evaluate and track the complications resulted from implanted portal catheters connected to patient who administer chemotherapy. It included four complications :

1. **Systematic Infection:** Pyrexia, Hypotension, Tachycardia
2. **Local Infection**: Inflammation at port pocket (PP), and tenderness at PP.
3. **Catheter Patency Problems:** Sluggish and complete blockage.
4. **Leakage at Port Site:** Swelling at port site and fluid leakage

Second Part: Grading Scale for Monitoring Extravasation which was adopted from (**Royal Marsden, 2015,)** , it included :

Skin colour, skin integrity, skin temperature, oedema, mobility, temperature, and pain (1–10) that was graded using the Wong-Baker Faces .The Pain Rating Scale is as follows: no pain scored zero, mild pain scored (1-3), moderate pain scored (4-6), and severe pain (7–10) .

Scoring System

One of two responses (Yes or No) is assigned for scoring; a "Yes" response indicates that the complication is present and is given a value of "1," while a "No" response indicates that it is not present and is given a value of "zero".

Tools Validity

Content and construct validity of the study tools were tested by a panel of five experts in the field of Medical-Surgical Nursing, two of them from Faculty of Nursing at Minia University and three from Faculty of Nursing at Assuit University and necessary modifications, were done

Tools Reliability

The study tools reliability was estimated using the Cronbach's Alpha Test to measure their internal consistency and evaluate how well they consistently measure. Cronbach's alpha reliability was (0.81).

Pilot Study

A pilot study was conducted on 10% (7 Pt.) of the study subjects who were fulfilling the inclusion criteria for testing the clarity, feasibility, and applicability of the developed tools.

Ethical Considerations

Written informed consent from patients was obtained to participate in the study after explaining the aim of the study and ensuring that data collection was used only for the purpose of the study. Official permission to conduct the study was obtained from the Research Ethics Committee (REC), Nursing Faculty (NF), and Minia University (MU), and second permission was obtained from the director of the MOC for approval to gather data for research

Study Procedure

Preparatory Phase

The researcher carried out the present study after formal authorization was achieved, tools were prepared through reviewing relevant related literature, and it ended by carrying out the pilot study.

Implementation Phase

The current study was conducted individually for each participant with a portal catheter by the researcher throughout their visits at the above-mentioned setting to assess portal catheter within approximately 30-35 minutes after an explanation of the study's purpose. Data collection started with the control group and then with the intervention group, using two tools. The implementation period of time for the first tool was 30–35 minutes, and for the second tool, it was all the period of care provided for the patient through the portal catheter. Patients follow up through their visits to the Minia oncology center for any care through the portal catheter. The researcher followed the patient visits through their medical records and by telephone communication with the head nurse. The researcher attended the Minia oncology center about 3 days per week or more, according to the patient's attendance. The control group received routine nursing care from hospital nurses who managing portal catheter. The intervention group received care for the portal catheter from the researcher, according to the nursing guidelines of the portal catheter.

Follow up for patients was through their visits to the Minia oncology center for any care through the portal catheter. The researcher followed the patient visits through their medical records and by telephone communication with the head nurse. The researcher attended the Minia oncology center about 3 days per week or more according to patient attendance.

The control group received routine nursing care from hospital nurses for managing portal catheter.

The intervention group received care for portal catheter from the researcher according to portal catheter nursing guidelines.

Evaluation Phase:-

The researcher used the second tool during the 1st, 2nd, and 3rd observations. Follow-up for patients is done before, during, and after each session of chemotherapy

The grading Scale for Monitoring Extravasation was observed and fulfilled by the researcher for both the intervention and control groups by using the 2nd part of the 2nd tool during the 1st, 2nd, and 3rd observations. Follow-up with patients was done to detect if there was an extravasation and the degree of it, then document it on the sheet.

Operational Definition

Nursing guidelines to prevent late complications are based on the policy of the portal catheter. The policy is based on National Health Service (NHS) nursing guidelines for the management of TIVADs.

Limitations of the Study

Limited national and international studies have been conducted regarding the correlation between the application of nursing guidelines for portal catheter and the prevention of late complications.

Statistical Analysis of Data

Data were summarized, tabulated, and presented using descriptive statistics in the form of frequency distribution, percentages, means and standard deviations (SD) as a measure of dispersion. A statistical package for the social science (SPSS), version (22) was used for statistical analysis of the data, as it contains the test of significance given in standard statistical books. Numerical data were presented in mean and SD. Qualitative data were presented in form of frequency and percentage (%). Chi-square, Fisher's and Pearson tests were utilized to compare frequencies and correlation between the study variables. Probability (P-value) is the level of significance of the results was considered: (p-value > 0.05) indicates a not significant (NS), (P-value ≤ 0.05) was considered significant (S) and the (p-value ≤ 0.01) was taken in to account as highly significant

Results

Table (1): Frequency Distribution of Studied Groups in Relation to their Demographic Data. (n= 70)

Demographic Data	Intervention Group (N= 35)		Control Group (N= 35)		*t-Test*	*P* – Value
	No.	%	No.	%		
Age / Years						
18-28	2	5.71%	1	2.^°%	1.882	.064
29-39	11	31.42%	4	11.42%		
40-49	9	25.71%	12	34.28%		
50-65	13	37.14%	18	51.42%		
Mean ± SD	49.26± 10.85		46.11± 11.66			
Gender						
Male	14	40.00	6	17.14	4.480	.034*
Female	21	60.00	29	82.85		
Occupation						
Employee	11	31.42	9	25.71	.280	.597
Non – Employee	24	68.57	26	74.28		
Educational Level						
Educated	29	82.85	19	54.28	6.629	.010**
Non – Educated	6	17.14	16	45.71		

X^2 = Chi-square Test / *= Statistically Significant Difference *P* – Value ≤ 0.05 / **= High Statistically Significant Difference *P* – Value ≤ 0.01

Table (1): Shows that more than a third of the intervention group and more than half of the control group were aged between 50 to 65 years old (37.14 and 51.42 percent respectively). More than half of the intervention group was female, while more than three-quarters of the CG were female (60.00 and 82.85 percent, respectively). In regards to occupation, the majority of both studied groups were non-employees (68.57% and 74.28%). lastly the education level, more than three-quarters of the intervention group were educated, compared to more than half of the control group (82.85 and 54.28 percent, respectively).

Table (2): Frequency Distribution of Studied Groups According to their Medical Data. (n= 70)

Chronic Diseases	Intervention Group (n= 35)				Control Group (n= 35)				X^2	*P* – Value
	Yes		No		Yes		No			
	No.	%	No.	%	No.	%	No.	%		
Liver Diseases	1	2.85	34	97.14	2	5.71	33	94.28	1.867	0.172
Diabetes Mellitus	2	5.71	33	94.28	2	5.71	33	94.28	0.000	1.000
Renal Diseases	4	11.42	31	88.57	4	11.42	31	88.57	0.072	0.788
Hypertension	5	14.28	30	85.71	7	20.00	18	80.00	0.933	0.334

X^2 = Chi-square Test / *= Statistically Significant Difference *P* – Value ≤ 0.05 / **= High Statistically Significant Difference *P* – Value ≤ 0.01

Table (2): Illustrates that very lower percentage (5.71 %) of the studied groups (intervention and control) had Diabetes Mellitus. More than tenth of the intervention group had hypertension, while nearly quarter of the control group had hypertension (14.28 and 20 percent, respectively)

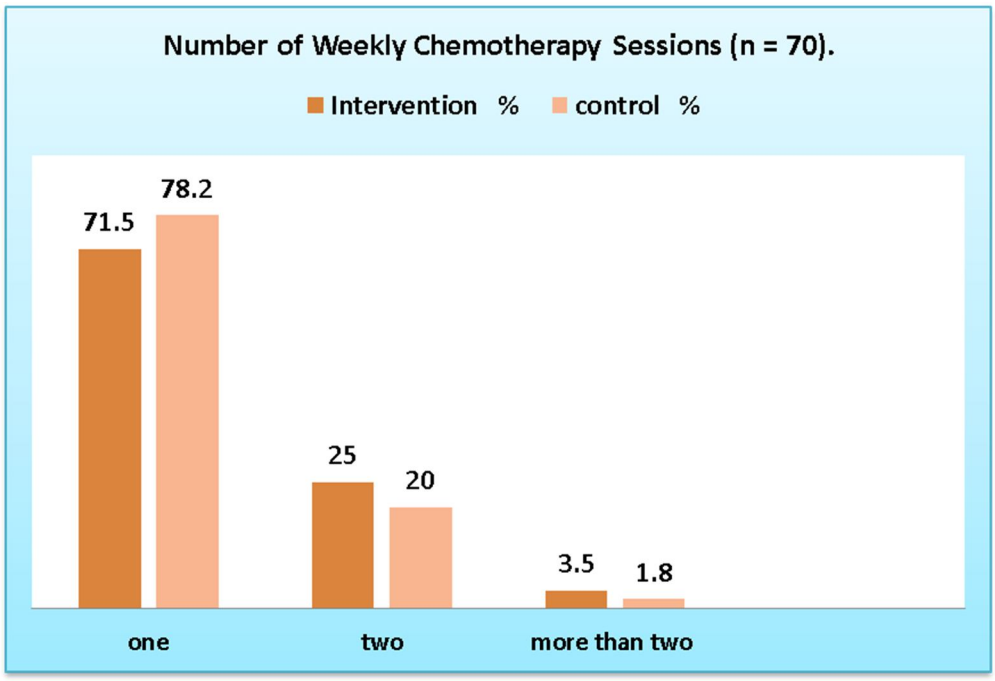

Figure (1): Frequency Distribution of the Studied Groups According to the Number of Weekly Chemotherapy Sessions (n = 70).

Figure (1): Reveals that nearly three quarters of the intervention group had one chemotherapy session per week, while major of the control group had one chemotherapy session per week (71.5 and 78.2 percent, respectively)

Table (3): Frequency Distribution of the Studied Groups According to Presence of Portal Catheter Complications at Three Observations. (n= 70).

Presence of Portal Catheter Complications	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	No	%	No	%	No	%	No	%	No	%	No	%
Systemic Infection												
Yes	1	2.85	3	8.27	4	11.42	17	48.57	4	11.42	26	74.28
No	34	97.14	32	91.42	31	88.57	18	51.42	31	88.57	9	25.71
X^2 (P- Value)	12.824(.042)				16.144(.000**)				33.857(.000**)			
Local Infection												
Yes	1	2.85	4	11.42	2	5.71	13	37.14	4	11.42	20	57.14
No	34	97.14	31	88.57	33	94.28	22	62.8	31	88.57	15	42.85
X^2 (P- Value)					18.768(.000**)				24.162(.000**)			
Catheter Patency Problems												
Yes	0	0	0	0	1	2.85	9	25.71	2	5.71	16	45.71
No	35	100	35	100	34	97.14	26	74.28	33	94.28	19	54.28
X^2 (P- Value)					7.503(.023*)				46.808(.000**)			
Leakage at Port Site												
Yes	2	5.71	7	20.00	3	8.57	11	31.42	3	8.57	17	48.57
No	33	94.28	28	80.00	32	91.42	24	68.57	32	91.42	18	51.42
X^2 (P- Value)	4.741(.192)				27.320(.000**)				31.4256(.000**)			

X^2 = Chi-square Test / *= Statistically Significant Difference *P* – Value ≤ 0.05 / **= High Statistically Significant Difference *P* – Value ≤ 0.01

Table (3): Reveals that **systematic infection** was present in **5.71** % of the intervention group while it was present in **8.27**% of the control group at the first observation, it was noticed that **systematic infection** percent increased among control groups at the second and third observation (**48.57** % , **74.28** %) respectively but it decreased among intervention group at second and third observations (11.4%) comparing with control group . While **local infection** was present in **2.85** % of the intervention group while it was present in **11.4** % of the control group at the first observation, it was noticed that **local infection** percent increased among control group at the second and third observation **(37.14** % & **68.57** %) respectively but it decreased among intervention group at second and third observations (**5.7**1 % & 1**4.28** %) respectively comparing with control group .

Table (4): Correlation between Demographic Data and Occurrence of Systemic Infection at Three Observations (n= 70).

Demographic Data	Systemic Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P-Value	r	P-Value	r	p-Value	r	P-Value	r	P-Value	r	P-Value
Age	0.179	0.222	-.130	.745	0.172	0.232	0.318*	0.024	0.086	0.552	0.549**	0.000
Sex	0.118	0.414	0.225	0.116	0.151	0.294	-0.158	0.274	0.075	0.605	.012٠	.421٠
Occupation	0.225	0.115	0.209	0.146	0.160	0.266	0.164	0.255	-.102	.714٠	.142٠	.614٠
Level of Education	-.005	.814٠	0.263	0.065	0.041	0.779	0.151	0.294	.312٠	.072٠	-0.442*	0.026

*= Statistically Significant Difference P – Value ≤ 0.05

**= High Statistically Significant Difference P – Value ≤ 0.01

Table (4) Shows that, there was no-statistical correlation between systemic infection and age among intervention group documented by P (0.232) compared to significant positive correlation among control group documented by P (0.024) at second observation, also there was no -statistical correlation between systemic infection and age among intervention group documented by P (0.552) compared to highly significant positive correlation among control group documented by P (0.000) at third observation and there was no-statistical correlation between systemic infection and level of education among intervention group documented by P (.072) compared to significant negative correlation among control group documented by P (0.026) at third observation

Table (5): **Correlation between Demographic Data and Local Infection at Three Observations (n= 70).**

Demographic Data	Local Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P-Value
Age	.192٠	.312٠	.004	.980٠	0.145*	.041٠	.040	.820٠	.220-	.205٠	.142-	.614٠
Sex	.145٠	.275٠	.045	.942٠	.139٠	.425٠	-.227	.190٠	.215	.214٠	.437*	.016٠
Occupation	.115٠	.718٠	.095	.586٠	-.040	.820٠	.029-	.870٠	٠,٥٢**	0.003	0.370*	0.034
Level of Education	.052٠	.912٠	.007	.914٠	.402٠	.114٠	.074	.673٠	-0.670**	0.009	-0.600**	0.000

Table (5) Reveals that, there was a positive statistical correlation between local infection and age among intervention group documented by P (0.041) and no statistical correlation between local infection and age among control group documented by P (0.820) at second observation, also there was highly statistical negative correlation between local infection and level of education among intervention documented by P (0.009) and control group documented by P (0.000) at third observation

Table (6): Correlation between Demographic Data and Catheter Patency Problems at Three Observations (n= 70).

Demographic Data	Catheter Patency Problems											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P-Value	r	P-Value	r	P-Value	r	P-Value	r	P-Value	r	P-Value
Age	.216٠	.183٠	0.078	.585٠	.019	.906٠	0.393*	.0.032	-.109	.498٠	-.100	.529٠
Sex	.112٠	.522٠	.000	1.000	.112	.522٠	-.115	.467٠	.226	.191٠	-.029	.868٠
Occupation	.145٠	.407٠	-.075	.667٠	.145	.407٠	-.093	.595٠	.139	.425٠	.031	.861٠
Level of Education	.268٠	.119٠	-.186	.286٠	-.226	.192٠	-.114	.513٠	-.053	.762٠	-.038	.829٠

*= Statistically Significant Difference P – Value ≤ 0.05

**= High Statistically Significant Difference P – Value ≤ 0.01

Table (6) Illustrates that, there was no-statistical correlation between Catheter patency problems and age among intervention group documented by P (0.906) compared to significant positive correlation among control group documented by P (0.032) at second observation

Table (7): Correlation between Demographic Data and Leakage at Port Site at Three Observations (n= 70).

Demographic Data	Leakage at Port Site											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P-Value	r	P-Value	r	P-Value	r	P-Value	r	P-Value	r	P-Value
Age	.061٠	..748٠	0.243	.196٠	.159٠	.402٠	.109٠	.567٠	.135٠	0.478	.176٠	.352
Sex	-.216	.252٠	-.111	.560٠	.295٠	.113٠	.009٠	.963٠	.168٠	0.376	-.243	.196٠
Occupation	-.195	.301٠	-.172	.363٠	.077٠	.685٠	.174٠	.358٠	.047٠	0.805	-.259	.168٠
Level of Education	.232٠	.128٠	-.016	.932٠	.157٠	.406٠	.127٠	.503٠	.268٠	0.153	0.437*-	.016٠

*= Statistically Significant Difference P – Value ≤ 0.05

**= High Statistically Significant Difference P – Value ≤ 0.01

Table (7) Shows that, there was no-statistical correlation between leakage at port site and level of education among intervention group documented by P (0.153) compared to significant negative correlation among control group documented by P (0.016) at third observation

Table (8): Correlation between Medical Data and Occurrence of Systemic Infection at Three Observations (n= 70).

Medical Data	Systemic Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	R	P- Value	R	P- Value	R	P- Value	r	P- Value	r	P- Value	r	P- Value
Liver Disease	.061	0.748	-.115	0.543	.047	0.805	.137	0.469	-.185	0.326	-.126	0.506
Diabetes Mellitus	-.216	0.252	.006	0.973	-.182	0.335	.007	0.972	-.038	0.840	-.057	0.765
Renal Disease	.195	0.301	.117	0.537	-.199	0.291	.222	0.238	.252	0.179	.199	0.293
Hypertension	.232	0.128	.203	0.282	.286	0.126	.600**	0.000	-.345	0.062	.202	0.286
Number of Chemotherapy Sessions Per Week	-.013	0..940	.166	0.340	.057	0.746	.084	0.631	-.142	0.416	.261	0.129

*= Statistically Significant Difference P – Value ≤ 0.05

**= High Statistically Significant Difference P – Value ≤ 0.01

Table (8): Reveals that, there was no-statistical correlation between Systemic infection and hypertension among intervention group documented by P (0.126) compared to highly significant positive correlation among control group documented by P (0.000) at second observation

Table (9): Correlation between Medical Data and Occurrence of Local Infection at Three Observations (n= 70).

Medical Data	Local Infection											
	1st Observation				2nd Observation				3rd Observation			
	Intervention		Control		Intervention		Control		Intervention		Control	
	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P- Value	r	P- Value
Liver Disease	-.089	0.639	.021	0.912	-.084	0.660	.146	0.441	-.084	0.660	.235	0.211
Diabetes Mellitus	.000	1.000	.171	0.366	.171	0.366	.280	0.133	-.372	0.061	.028	0.884
Renal Disease	-.106	0.575	.275	0.141	-.372	0.061	.000	1.00	-.320	0..085	-.219	0.245
Hypertension	.347	0.060	.163	0.389	-.050	0.792	.173	0.362	.015	0.938	.051	0.787
Number of Chemotherapy Sessions Per Week	.174	0.318	.176	0.312	-.147	0.400	.105	0.547	.488**	0.003	.020	0.908

Table (9) Illustrates that there was no -statistical correlation between **local infection** and number of chemotherapy sessions per week among control group documented by P (**0.908**) compared to highly significant positive correlation among intervention group documented by P (0.003) at third observation

Discussion

Totally implantable venous access devices (TIVADs) are primarily used for chemotherapy or parenteral nutritional support in patients with malignant tumors. The subclavian, internal jugular, and axillary veins are common puncture sites for TIVAD implantation (**Qiu et al., 2023).**

Central venous port devices (CVPD) are indicated for patients who need long-term intravenous therapy. Oncology patients may require intermittent administration of chemotherapy, parenteral nutrition, infusions, or blood transfusions. A VPS is composed of a port chamber attached to a central catheter, which is implanted into the central venous system (CVS) **(Machat et al., 2019).**

Regarding age, the current study shows that more than a third of the IG was between the ages of 50 and 65. According to the researcher's perspective, The majority of people over fifty are more likely to experience a wide range of health problems, such as cancer, cardiac, respiratory, hepatic, renal, and neurological diseases, as a result of aging and physiological changes. The current findings of the study are opposite those (**Kim et al., 2019)** who revealed that nearly half of cases were aged ≥60 years.

As regards gender, the current study found that more than half of the IG was female. The researcher's point of view that these findings may be attributed to the fact that females are more likely than men to develop cancer diseases is supported by the study's findings. This is because women experience higher hormone levels during pregnancy and family planning procedures, in addition to higher exposure to major stresses and occupational hazards. The present study is in conformity with **(Kim et al., 2019)** who found that more than half of the studied samples were female. The current study finding is contradicted by (**Tsuruta et al., 2020)** who revealed that more than half of the studied sample were mal

Concerning the educational level, it was observed that most of the IG was educated. These results might be attributed to the fact that most people are concerned with education in general. Learning becomes one of the first priorities for people because it helps them avoid health problems. The current study finding is compatible with the study conducted by **(Mersal et al., 2019)** which indicated that more than half of the intervention group was educated.

As regards the medical data of the intervention group, the findings of the current study indicated that more than ten percent of the intervention group had hypertension. The researcher's interpretation of the study's findings might be attributed to a hereditary factor or a life stressor. The current study result is consistent with **(Odabas et al., 2014),** who showed that more than ten percent of patients had hypertension.

The findings of the current study indicated that more than ten percent of the intervention group had renal diseases. The researcher's interpretation of the study's findings was that renal diseases were considered one of the major diseases that affected the patients.

In relation to medical data, the present study illustrates that the majority of the intervention group takes one chemotherapy session weekly. The researcher's interpretation of the study's findings is that attending the oncology center once per week may reduce the incidence of complications related to an implanted portal catheter.

Regarding the presence of systematic infection complications, the current study reveals that more than ten percent of the intervention group had a systematic infection at the third observation. The findings of the current study contradict those of **(Mersal et al. 2019),** who observed that twenty percent of the intervention group had a systematic infection. Post-educational guidelines

Concerning the presence of local infection complications, the present study illustrated that local infection percentages increased among the intervention group at the third observation. This finding agrees with **(Qiu et al., 2022**) who found that local infections were a complication from the port.

Related to leakage at the port site, the current study noticed that fluid leakage percent increased among the intervention group at the third observation. From the researcher's point of view, this could be attributed to the patient's failure to follow instructions related to implant portal catheter care. This finding disagrees with (**Tsuruta et al., 2020)** who mentioned that a very low percentage of cases had fluid leakage.

Concerning the correlation between demographic data and the presence of complications at three observations, the current study revealed that there was no statistical correlation between systemic infection and demographic data among the intervention group at three observations. This result of the current study is explained by the researcher's point of view: demographic data were not risk factors for the incidence of systemic infection, and there were other variables that led to it.

The current study reveals that there was a positive statistical correlation between local infection and age among the intervention group at the second observation. This result of the current study is explained by the researcher's point of view that age is a risk factor for the incidence of local infection.

According to the current study, at the third observation, there was a statistically significant negative association between the intervention group's level of education and the local infection. This result of the current study is explained by the researcher's point of view that level of education is a risk factor for the incidence of local infection.

This study revealed that there was no statistical correlation between catheter patency problems and demographic data among the intervention group at three observations. The researcher's explanation of this result suggests that the incidence of catheter patency problems was not associated with demographic data

As regards the correlation between medical data and the presence of complications at three observations, the current study's findings showed that there was no statistical correlation between systemic infection and medical data among the intervention group at three observations. The researcher's explanation of this finding was that medical data were not risk factors for the development of systemic infections.

Finding of this study presented that there was a highly significant statistically positive correlation between local infection and the number of chemotherapy sessions per week among the intervention group at the third observation. The researcher's explanation of this finding was that the number of chemotherapy sessions per week was a risk factor for the development of local infection.

Finally, the current study predicted that applying nursing guidelines regarding implanted portal catheters would reduce the occurrence of late complications resulting from them among chemotherapy patients

Conclusion

In light of the current study results and research hypothesis, the following can be inferred that:

- **According to Hypothesis 1,** the current study illustrated that there was a lower percentage of all patients' late complications in the IG post-application of guidelines than in the CG who received routine nursing care.
- **According to Hypothesis 2,** the current study revealed that there was a highly significant correlation between local infection and occupation among the IG and a significant correlation between local infection and occupation among the CG at the third observation.
- **According to Hypothesis 3,** the current study showed that there was a significant correlation between extravasation and liver disease among the IG and a significant positive correlation among the CG at the third observation

Recommendations

Recommendations Related to Nurses

- Designing an in-service training educational program for nurses to advance nurses' knowledge and practice concerning PAC
- Developing a broad nursing guidelines brochure, including simple instructions to sidestep late complications for PAC.

Recommendations Related to Patients

- The designed leaflet includes patient instructions about how to evade late complications of PAC.

Recommendations for Furthers Researches

- Replication of the current study on a larger sample size to generalize the findings.
- Encourage further research about the nurses' role concerning implanted portal catheters

References

1. Chandveettil, J., Kattepur, A. K., Pareekutty, N. M., Alapatt, J. J., Mathiyazhakan, A. R., Kumbakara, R., ... & Balasubramanian, S. (2021). Totally implantable venous access devices in cancer chemotherapy: A retrospective analysis of 8421 catheter days in a tertiary cancer center. Cancer Research, Statistics, and Treatment, 4(3), 449.
2. Kim, D. H., Ryu, D. Y., Jung, H. J., & Lee, S. S. (2019). Evaluation of complications of totally implantable central venous port system insertion. Experimental and therapeutic medicine, 17(3), 2013-2018.
3. Li, Y., Guo, J., Zhang, Y., & Kong, J. (2022). Complications from port-a-cath system implantation in adults with malignant tumors: a 10-year single-center retrospective study. Journal of Interventional Medicine, 5(1), 15-22.
4. Machat, S., Eisenhuber, E., Pfarl, G., Stübler, J., Koelblinger, C., Zacherl, J., & Schima, W. (2019). Complications of central venous port systems: a pictorial review. Insights into imaging, 10(1), 1-12.

5. Mersal , N.A., Sofar, S.M., & Elnakshabandy, E. (2019). Effect of Educational Guidelines on Nurses' Performance regarding Prevention of Port-A- Catheter complications among Patients Undergoing Chemotherapy. International Journal of Novel Research in Healthcare and Nursing Vol. 6, Issue 2, pp: (1296-1310), Month: May - August 2019, Available at: www.noveltyjournals.com.
6. Mohamed, H. H., Mohamed, M. A. F., Abdelaziz, T. M., & Mohammed, N. M. (2023). Assessment of Nurses' Knowledge and Practice Regarding Implanted Port-A-Catheter Care for Patients Undergoing Chemotherapy. Alexandria Scientific Nursing Journal, 25(3), 1-12.
7. Odabas, H., Ozdemir, N.Y., Ziraman, I. et al. Effect of port-care frequency, on venous port catheter-related complications in cancer patients. Int J Clin Oncol 19, 761–766 (2014). https://doi.org/10.1007/s10147-013-0609-7
8. Qiu, X., Jin, G., Zhang, X., Xu, L., Ding, J., Li, W., ... & Wei, L. (2023). Expert consensus on the clinical application of totally implantable venous access devices in the upper arm (2022 Edition). Journal of Interventional Medicine.
9. Tsuruta, S., Goto, Y., Miyake, H., Nagai, H., Yoshioka, Y., Yuasa, N., & Takamiza wa, J. (2020). Late complications associated with totally implantable venous access port implantation via the internal jugular vein. Supportive Care in Cancer, 28, 2761-2768.
10. Velioğlu, Y., Yüksel, A., & Sınmaz, E. (2019). Complications and management strategies of totally implantable venous access port insertion through percutaneous subclavian vein. Turkish Journal of Thoracic and Cardiovascular Surgery, 27(4), 499