

## Effect of Nursing Protocol on Nurses' Performance and Venous Thromboembolism Risks Among the Patients with Cancer Undergoing Surgery

Nagwa Mohamed Ahmed<sup>1</sup>, Ghada Hassan Ahmed<sup>2</sup> & Shaymaa Sayed Khalil<sup>3</sup>

<sup>1</sup>. Assistant Professor of Medical- Surgical Nursing, Faculty of Nursing, Assiut University, Egypt.

<sup>2</sup>. <sup>3</sup>. Lecturer of Medical- Surgical Nursing, Faculty of Nursing, Assiut University, Egypt.

### Abstract

**Background:** Nurses play an important role in identifying, preventing and caring of VTE among cancer surgery patients. **Aim:** To assess the effect of nursing protocol on nurses' performance and venous thromboembolism risks among the patients with cancer undergoing surgery. **Research design:** A quasi-experimental (pre- posttest) research study on (30) nurses who working in surgical oncology department, at Assiut University Hospital, and (60) randomly selected patients with cancer undergoing surgery divided equally in to two groups (study and control). **Tools:** Three tools were utilized; A structured self-administered questionnaire, observational check list and VTE risk factors assessment scale. **Results:** The mean score of total nurses' knowledge and practice significantly increased after the intervention nursing protocol. There was a statistically significant difference between both groups regarding venous thromboembolism risks and half of the studied patients had intermediate risk of VTE while two thirds had high risks post application of the nursing protocol. **Conclusion:** The implementation of the nursing protocol had a significant improvement on nurse's knowledge and practice in addition to a significantly diminishing of thromboembolism risks among study than control group. **Recommendation:** Regularly updating and refreshing the nurses' knowledge and practice are recommended through workshops to minimize the risks of VTE among the patients with cancer undergoing surgery.

**Keywords:** *Cancer Surgery, Nurses' Performance, Protocol, & Venous Thromboembolism Risks.*

### Introduction

Cancer is a diseases process when a cell is transformed by genetic mutation of cellular deoxyribonucleic acid. Genetic mutation may be inherited or acquired, leading to abnormal cells. The initial genetically altered cell forms a clone and begin to proliferate abnormally (Janice & Kerry, 2018).

Patients with cancer may present many types of hemostatic disorders that significantly contribute to morbidity and mortality in this disease. A tight relationship exists between malignant disease, the occurrence of coagulation abnormalities and thrombosis. The relationship relies on the evidence that cancer induces a prothrombotic switch of the hosthemostatic system, and in turn, blood clotting activation stimulates tumor growth and dissemination (Falanga et al., 2017).

A venous thrombosis contains red blood cells, white blood cells, and platelets that are held together by fibrin. Thrombi often form on the cusps of venous valves. Additional blood cells and fibrin collect to create a large thrombus with a tail. The vessel lumen ultimately can be obstructed. A thrombus causes inflammation of the vein, inflammation or occlusion is responsible for clinical manifestation of deep venous thrombosis as swelling, warmth, pain,

redness, low-grade fever, tenderness and cyanosis in the affected extremity (Berridge et al., 2016).

Several risk factors for developing venous thrombosis usually coexist in patients with cancer including surgery, hospital admissions, immobilization, the presence of an indwelling central catheter, chemotherapy, and new molecular targeted therapies. Furthermore, other comorbid features will also influence the overall of thrombotic complications, as present in patients without cancer (Elhayeg et al., 2018)

Surgery complications can be developed any time during, immediately after or a few days or weeks from surgery. Sometimes late complications develop months after surgery. Most of them may go away on their own or can be treated, but some may last a long time or become permanent including different types such as infection, impaired wound healing, altered pulmonary or renal function, and the development of VTE may occur (Inzucchi et al., 2012).

Venous thromboembolism (VTE) can occur after cancer surgery because a person cannot move around very well or because of other factors. In the most serious cases, a blood clot can break off and travel to the lungs (pulmonary embolus(PE). The nurse has avital role to decrease the risk of VTE occurrence among the cancer patients who were undergoing surgery through stopping smoking before surgery,

frequent position changes, leg and ankle exercises and getting up and moving around soon after surgery also help reduce blood clots. People who are at high risk for developing blood clots may be given low doses of a blood thinner, such as heparin, to help reduce the risk (Cascio et al., 2018).

It is well established that the risk of VTE is high in the postoperative period for all patients, including those with cancer. However, this risk is variable according to surgery type (Li et al., 2018). Preventative strategies for VTE with healthcare team by taking into account of individual needs for patients undergoing oncology surgery. Some strategies that may be used include; surgeon may prescribe medication called an anti-coagulant (prevents clot formation), which is generally given as an injection following surgery. Anti-embolic (compression) stockings may be given to wear just before and after surgery. Asked to walk short distances every hour (except when sleeping) and asked to perform leg exercises while resting in bed or a chair, as advised by the healthcare team (Gashi et al., 2018).

Patient undergoing surgery for cancer require general nursing care. Care is generally according to age, specific deficits, cultural implication and altered immunity. The nurse provides the patient and family with verbal and written information about surgical procedure, instructions, diet, and bowel preparation are also provided, prospectively nurse assess the patient responses to surgery and monitors the patient for possible complications, such as infection, bleeding, thrombophlebitis, wound dehiscence, fluid and electrolyte imbalance, and organ dysfunction (Janice & Kerry, 2018).

### Significance of the study

Patients with cancer undergoing surgery have a higher risk of developing VTE compared with their nonsurgical counterparts, and VTE is the number one cause of death among such group of patients within (30) days post-surgery and attempted to shed light on the increased cost of the medical care of cancer developed VTE (Lyman et al., 2017).

According to Assiut University Hospital records (2019), it has been found that (5338) patients in one year (2017/2018) diagnosed with cancer. Internationally, the patients with cancer constitute 20%-30% of them suffered from and diagnosed with venous thromboembolism (VTE). Depending on the type of tumor, extent of malignancy, type of cancer treatment, and presence of other risk factors, 1%–25% of patients with malignancy will develop thrombosis. Locally, there was no local formal statistics about the percentage of VTE among cancer patients (Grandoni, & Alberio, 2019).

### Operational definitions

- **Nursing protocol:** is considered to be a set of predetermined criteria that define appropriate nursing interventions that articulate or describe situations in which the nurse makes judgments relative to a course of action for effective management of common patient care problems (Brown, 2014).
- **Nursing performance:** is defined as the capacity demonstrated by an organization to acquire the needed nursing resources and knowledge for using them in a suitable manner to produce nursing service that effectively improve patients' conditions (Dubois et al., 2013).
- **Venous thromboembolism (VTE):** is a condition in which a blood clot forms most often in the deep veins of the leg, groin or arm (known as deep vein thrombosis, DVT) and travels in the circulation, lodging in the lungs (known as pulmonary embolism, PE). Together, DVT and PE are known as VTE - a dangerous, potentially deadly medical condition (Ahmed, 2012).
- **Cancer Surgery:** is the first option in the treatment of many firm malignant tumors. Surgery to treat cancer removes the cancerous tumor and the healthy tissue surrounding it to prevent the spread of the tumor locally (National Cancer Institute, 2018)

### Aim of the study

The current study aimed to assess the effect of nursing protocol on nurses' performance and venous thromboembolism risks among the patients with cancer undergoing surgery.

### Specific objectives

- Assess the nurses' knowledge mean score regarding venous thromboembolism among the patients with cancer undergoing surgery post the nursing protocol application.
- Assess the nurses' practice mean score regarding venous thromboembolism among the patients with cancer undergoing surgery post nursing protocol application.
- Assess the level of venous thromboembolism risks among the patients with cancer undergoing surgery post the nursing protocol application.

### Study hypotheses

- The nurses' knowledge mean score regarding venous thromboembolism among the patients with cancer undergoing surgery post the nursing protocol application will be higher than pre-intervention test.
- The nurses' practice mean score regarding

venous thromboembolism among the patients with cancer undergoing surgery post nursing protocol application will be higher than pre-intervention test.

- The level of venous thromboembolism risks among the study group patients with cancer undergoing surgery will be minimizing than control group post the nursing protocol intervention.

### Subject and methods

#### Research design

A quasi experimental (pre- posttest) research design used in the study

#### Setting

This study was conducted in the Surgical oncology department, at Assiut University Hospital.

#### Subject

There were two subjects included in this study (nurses and patients)

#### Regarding nurses sample

The study subject included (30 nurses) who working in oncology department, at Assiut University Hospital.

#### Regarding patients sample

In addition, to a randomly selected (60) patients admitted to the surgery oncology department, at Assiut University Hospital.

Who divided equally into two groups study and control.

#### Inclusion criteria

In general, all patients with cancer undergoing cancer surgery (i.e., solid tumors and lymphomas).

#### The randomization to aside of the study sample to avoid bias

- The study group patients who admitted in the single ever numbered rooms (1, 3 and 5) in the surgical sectors.
- The control group patients who admitted in the double ever numbered rooms (2, 4 and 6) in the surgical sectors.

#### Study tools

Three tools were utilized for data collection included the following:-

#### Tool (I): A structured self-administered questionnaire

It was used prior to the implementation of the nursing protocol.

The same tool was used immediately post its implementation (immediate post-test) to evaluate the gain in knowledge.

It translated into Arabic language for easily application.

#### It consisted of two parts

**Part (1):** Demographic characteristics for nurses:

Consisted of nurses' code, age, sex, marital status, qualification, years of experience, and attaining

previous training program about nursing care of (VTE). This part developed by the researcher based on the aim of the study to assess demographic characteristics of the studied nurses.

**Part (2):** Assessment of nurses' knowledge about VTE:

This part was developed by the researcher based on current, national and international literature.

It aimed to assess exact nurses' knowledge regarding venous thromboembolism (VTE) e.g. definition, risk factors, causes, manifestation, complications, medical, nursing care of VTE and discharge instructions.

This tool used pre and immediately post the nursing protocol application.

It consisted of a reliable and valid questionnaire contained 16 questions;

#### Scoring system

Total scores were 32 degrees.

Each complete correct answer was given two degrees, where the incomplete correct was given one degree, while the wrong answer was given zero

Those who obtained less than (70%) were considered unsatisfactory level of knowledge. While those who obtained above than (70%) were considered satisfactory knowledge level (Onianwa et al., 2017).

#### Tool (II): An observational check list for nurses:

This tool developed by the researchers based on the international literatures (Kulkarni et al., 2019) then this tool translated into Arabic language to easy the application.

- It was used to assess the practice regarding venous thromboembolism among patients with cancer undergoing surgery.
- It included preparation steps regarding venous thromboembolism among cancer surgery patients this tool consisted of (52) steps regarding identification, prevention and management of VTE risks among patients with cancer pre and postoperative.

The tools used pre and immediately post the nursing protocol application.

**Scoring system:** Total score was 104 degrees; zero degree was given for each wrong or missing step in practice, one degree for each incomplete step in practice & two degrees for each right step in practice Those who obtained less than (70%) were considered having unsatisfactory practice level. While those who obtained above than (70%) considered having satisfactory practice level. (Walker et al., 2014).

The studied subject was participating in filling the questionnaire and observed by checklist at the first day, then explaining the nursing protocol; then post-test by questionnaire and checklist were done.

**Tool (III): Venous thromboembolism risk factors assessment**

This tool used post the nursing protocol application and from 1 to 30 days postoperatively for each randomly selected patient (study and control groups).

These 30 days is the range while the VET occurs after cancer surgery (Lyman et al., 2017).

**It consisted of two parts**

**Part (1):** Demographic and medical data:

This part developed by the researcher based on the aim of the study to assess demographic and medical data of both study and control groups.

Which included age, sex, educational level, occupation, residence, cancer site and BMI.

**Part (2): VTE Risk factors assessment scale**

This scale was developed by Khorana et al., (2016) and it included five general items:

**1-cancer type:** (Stomach =+2, pancreases = +2, lung= +1, Lymphoma= +1, Gynecologic =+1, Bladder= +1, Testicular = +1, and other types = +1)

**2- Pre-chemotherapy platelet count  $\geq 350 \times 10^9/L$ :** (present =+1, and absent =0)

**3- Hemoglobin level  $< 10$  g/dL or using RBC growth factors:** (present =+1, and absent =0)

**4-Pre-chemotherapy leukocyte count  $> 11 \times 10^9/L$ :** (present =+1, and absent =0).

**5- Body mass index (BMI)  $\geq 35$  kg/m<sup>2</sup>:** (present =+1, and absent =0)

- Which calculated the score in electronic medical records (EMR) that available at: <https://www.mdcalc.com/khorana-risk-score-venous-thromboembolism-cancer-patients#why-use>.
- The researcher conducted this scale through on line link for both study and control groups post application of the nursing protocol.

**Scoring system: the total score calculated and interpreted as the following**

Risk Group	Score	2.5-month rate of VTE
Low	0	0.3 - 0.8%
Intermediate	1 – 2	1.8 - 2.0%
High	$\geq 3$	6.7 - 7.1%

**The nursing protocol**

The researchers prepared the nursing protocol after extensive reviewing recent literature. It was designed in a simplified Arabic language and was supported by photo illustrations and colored pictures.

According to the nurses' needs (knowledge and practice) that can help them in provision of high quality nursing care. It comprises: knowledge about venous thrombosis (VTE) e.g. definition, causes, manifestation, complications, prevention and nurses'

practice regarding nursing care pre and post-operative care for patients with cancer in surgical sector in oncology department for identification, prevention and management of VTE.

**Validity and reliability**

Content validity of the used tools was done by (5) jury of specialists in the field of medical- surgical nursing and oncology field.

The reliability was tested for tools by using Cronbach's alpha coefficient 0.84 and 0.78.

Regarding tool (III) this risk model has been validated externally in 2 independent cohorts. The Vienna Cancer and Thrombosis study—a prospective observational cohort study of 819 patients initiating cancer treatment (including surgery and radiotherapy in addition to chemotherapy) as outpatients—found a cumulative incidence of VTE in 7.4% patients at a median follow-up of 656 days The reliability was tested for tools by using Cronbach's alpha coefficient 0.85.

(Kearney et al., 2009).

**Ethical considerations**

The study was following the common ethical guidelines of clinical research according to the declaration principles of Helsinki, (1996) for medical research. Confidentiality and anonymity were guaranteed. Nurses and patients had the freedom to participate and or withdraw from the study whenever they want. No names appeared on any results and a coding system known only to the researcher was developed and used.

**Pilot Study**

A pilot study was conducted to test visibility and applicability of the used tools and to estimate the time required for data collection tools. Which applied on (10%) the study subjects (3 nurses and 6 patients who were chosen randomly). Some minor modifications based on the result of the pilot study were made to have more applicable tools for data collection. Some statements were omitted, and then the final forms were developed, so the total subject did not include the pilot study to ensure the stability of the results.

**Data collection methods**

- Official letters were issued to the director of the hospital and to the head of the surgical oncology department as well as the hospital nursing director. Names of nurses included in the study were obtained from the head nurses of the selected department.
- Nurses were approached individually to explain the purpose and the nature of the study and to obtain their written consent for participation.
- Duration of study: Data were collected throughout a period of the 6-months between

June to October, 2019.

- The self-administered questionnaire was administered to the studied nurses to assess their knowledge (**tool I**).
- The nurse's practice regarding nursing care pre and post-operative care of the patients with cancer for identifying, prevention and management of VTE among patients with cancer undergoing surgery was assessed by observational checklist (**Tool II**).
- Development the nursing protocol based on nurses' needs (knowledge and practice)
- Nursing protocol teaching sessions: the researchers scheduled with the nurses the sessions for both theory and practice and the nurses were divided into small groups or according to their workload, each group contained 10 nurses from each shift, then the nurses were oriented about the objectives of the nursing protocol.
- There was no dropout and all nurses adhered in participation because the researchers concurred with the chief of the department and took permission on the schedule of nurses' participation.
- Short interactive lectures and group discussions supported by audio-visual aids as power point lectures, illustrated pictures and videos; were conducted for each group.
- Each session lasted (30) minutes, 10 sessions were covered in the first week and the same sessions repeated in the second week, 2 sessions daily; one for the morning group and one for night group.
- Continuous feedback and communication assured to clear any misunderstanding of these sessions.
- The researchers were available for five days/week at two shifts for 2 hours per shift.
- Then the practical part which consisted of three sessions each one lasted for half an hour and covered around two weeks, through demonstration and re-demonstrations using audiovisual aids.
- Nurses were evaluated immediately post-test after application of the nursing protocol using the same pretest tools (**I and II**).
- After 30 days post the nursing protocol application for the surgical oncology nurses, the researcher selected the studied patients randomly by selecting all the patients with cancer undergoing surgery through small paper blinded selected.
- The study group (30) patients admitted in the single even numbered rooms (1, 3 and 5).
- The study group (30) patients admitted in the double even numbered rooms (2, 4 and 6).
- Then the aims and objectives of the study were explained to each patient individually and only those who gave their consent participated in the study.
- The researcher assessed both study and control patients' risk factors using tool (**III**), from the patients' folders it took around 10 minutes to fill it and calculated the risk score using online electronic medical records (EMR); if high, the clinician seeing the patient was alerted, and a lower extremity ultrasound for early detection of DVT was suggested.
- Currently, the score used to educate high-risk patients about the warning signs and symptoms of VTE. As mentioned, the researchers were piloting a strategy for early detection using screening ultrasound of lower extremities with the assistance of the oncology physician and radiologist.
- Finally, the researchers anticipate data regarding thromboprophylaxis in high-risk patients which could be another application of the score.
- The total risks score of the study group compared with control groups, to assess the effect of the nursing protocol on the VTE risks among the studied patients.

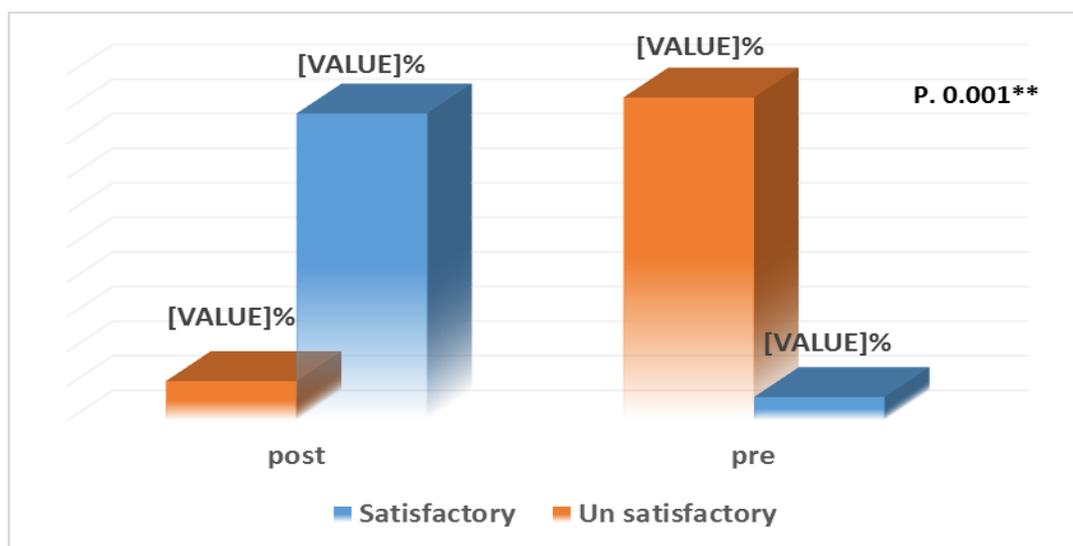
### Statistical analysis

Data was presented using SPSS program (version 20) in numbers, percentages, mean and standard deviation (SD), Paired T-test, chi square analysis were used for assessment of the inter-relationships among quantitative variables. The level of significant was adopted at  $p < 0.05$

Results

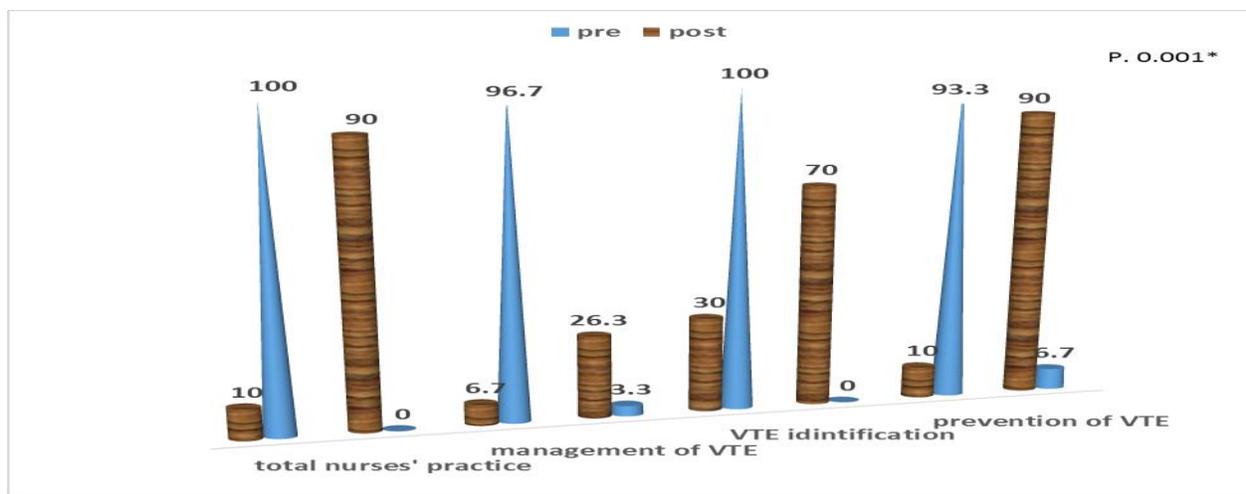
Table (1): Frequency and percentage distribution of demographic data for the nurses under study (N.=30).

Demographic characteristics		N.=30	%
Age groups in years	<20	3	10
	20<40	19	63.3
	≥ 40	8	26.7
Mean ± SD		25.7± 5.79	
Sex	Male	1	3.3
	Female	29	96.7
Marital status	Single	12	40.0
	Married	17	56.7
	Widow	1	3.3
Level of education	Diploma	11	36.7
	Technical Institute	16	53.3
	Bachelor	3	10.0
Years of experience	>5 years	22	73.3
	5-10 years	4	13.3
	>10 years	4	13.3
Mean ± SD		1.6 ± 0.486	
Previous training regarding venous thrombo -embolism for cancer surgery patients	Yes	12	40.0
	No	18	60.0



Independent t. test, \*\* statistically significant difference p. value < 0.05.

Figure (1): Percentage distribution of the total knowledge level scores levels among the nurses under study (pre-& post nursing protocol application) (N.=30)



Chi square test, \*\* statistically significant difference p. value < 0.05.

Figure (2): Percentage distribution of the total practice level scores levels among the nurses under study (pre- & post nursing protocol application) (N.=30)

Table (2): Relationship between studied nurses' performance (knowledge and practice) mean scores for and selected demographic variables pre and post nursing protocol application (N=30)

Demographic variables	Knowledge score		Practice Score	
	Pre	post	Pre	post
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
<b>Gender</b>				
Male	2.29±0.76	19.86±0.38	19.24±1.55	103.29±21.3
Female	5.45±5.14	18.83±2.69	18.07±4.33	98.58±14.59
<b>P. value</b>	<b>0.111<sup>ns</sup></b>	<b>0.322<sup>ns</sup></b>	<b>0.123<sup>ns</sup></b>	<b>0.451<sup>ns</sup></b>
<b>Age</b>				
<20 years	5.75±3.3	18.25±1.71	95±5.94	103.25±17.32
from 20 - 30 years	4.38±5.37	18.63±3.3	96.56±14.18	96.56±14.18
from 30 and more	5.92±4.55	19.5±1.06	83.25±17.32	99.88±0.34
<b>P. value</b>	<b>0.501<sup>ns</sup></b>	<b>0.387<sup>ns</sup></b>	<b>0.237<sup>ns</sup></b>	<b>0.350<sup>ns</sup></b>
<b>Marital status</b>				
Single	3.4±3.03	18.6±2.07	94±6.63	102.6±0.97
Married	5.42±5.19	19±2.68	80.16±16.42	99.76±0.56
<b>P. value</b>	<b>0.241<sup>ns</sup></b>	<b>0.658<sup>ns</sup></b>	<b>0.250<sup>ns</sup></b>	<b>0.489<sup>ns</sup></b>
<b>Educational Level</b>				
Diploma in Nursing	4.33±4.08	19.24±1.55	100.11±14.91	99.73±0.65
Bachelor of Nursing	7.33±6.58	18.07±4.33	96.2±16.84	102.73±0.59
<b>P. value</b>	<b>0.041*</b>	<b>0.123<sup>ns</sup></b>	<b>0.398<sup>ns</sup></b>	<b>1.000<sup>ns</sup></b>
<b>Experience years:</b>				
< 1 years	6±2.65	18.67±0.58	45.33±8.74	104±0
from 1- <5 years	3.06±4.08	18.89±2.19	42.89±7.9	103.61±0.85
from 5 - 10 years	4.73±4.27	18.33±4.34	57.87±15.81	102.6±0.74
more than 10 years	6.71±5.69	19.42±1.1	75.08±18.17	103.88±0.34
<b>P. value</b>	<b>0.119<sup>ns</sup></b>	<b>0.643<sup>ns</sup></b>	<b>0.072<sup>ns</sup></b>	<b>0.390<sup>ns</sup></b>
<b>Previous training regarding venous thromboembolism risks</b>				
Yes	5.25±5.19	19.75±0.5	117.75±16.88	104±0
No	18.89±2.63	5.07±4.97	97.8±14.51	89.71±0.65
<b>P. value</b>	<b>0.521<sup>ns</sup></b>	<b>0.050*</b>	<b>0.389<sup>ns</sup></b>	<b>0.011*</b>

Cross tab, Paired T-test

\* statistically significant difference at P. value <0.01

<sup>ns</sup> non statistically significant difference at P. value >0.05

Table (3): Relationship between study and control groups regarding their demographic data (N. =30)

Demographic data	Study		Control		P.value
	N.=30	%	N.=30	%	
<b>Age in years:</b>					
18- 29	2	6.6	1	3.3	<b>0.500<sup>ns</sup></b>
30-40	9	30	8	26.7	
41 - 49	11	36.7	12	40	
50 – 65	8	26.7	10	33.3	
<b>Sex:</b>					
Male	14	46.7	15	50	<b>0.67<sup>ns</sup></b>
Female	16	53.3	15	50	
<b>Marital status:</b>					
Single	2	6.6	3	10	<b>0.219<sup>ns</sup></b>
Married	26	86.6	25	83.3	
Divorced	0	0	1	3.3	
Widowed	2	6.6	1	3.3	
<b>Education level:</b>					
Illiterate	22	73.4	23	76.7	<b>.289<sup>ns</sup></b>
Primary	2	6.6	3	10	
Preparatory	1	3.3	1	3.3	
Secondary	5	16.7	3	10	
<b>Occupation:</b>					
House wife	27	90.0	25	83.3	<b>.287<sup>ns</sup></b>
Worker	3	10.0	5	16.7	
<b>Residence:</b>					
Urban	3	10.0	5	16.7	<b>.837<sup>ns</sup></b>
Rural	27	90.0	25	83.3	

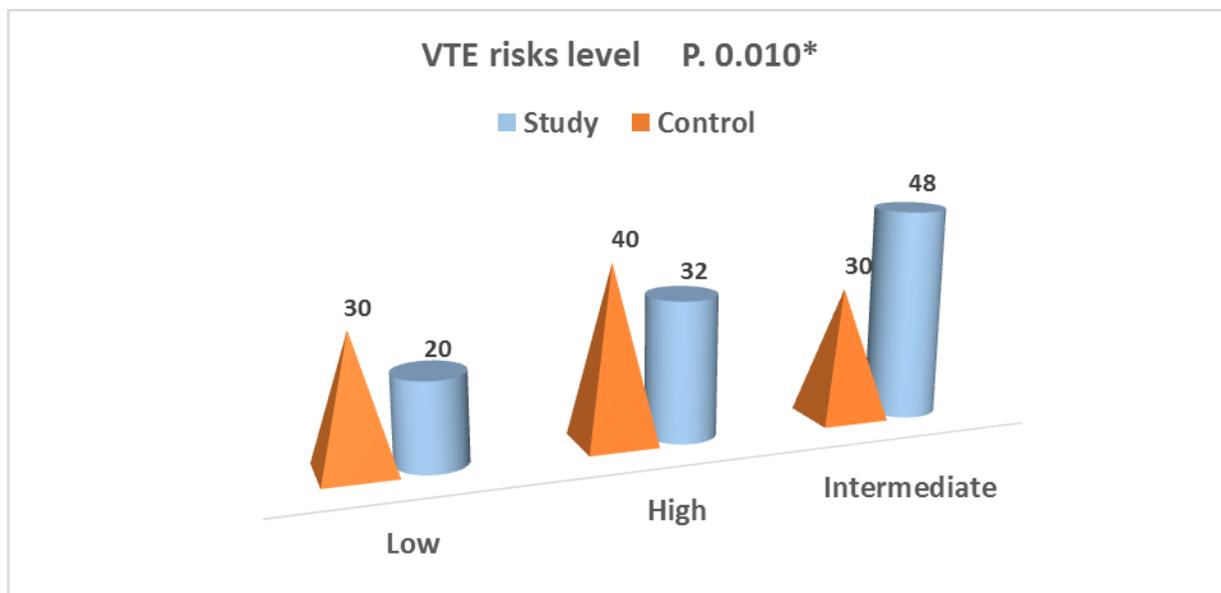
Chi square test, \*\* statistically significant difference p. value < 0.05

<sup>ns</sup> non statistically significant difference p. value > 0.05.

Table (4): Relationship between study and control groups regarding their medical data (N. =30).

Medical data	Study		Control		P. value
	N.=30	%	N.=30	%	
<b>1. Cancer site:</b>					
• Bladder	6	20	7	23.3	<b>.098<sup>ns</sup></b>
• Lung	2	6.6	1	3.3	
• Colon	6	20	7	23.3	
• Breast	6	20	7	23.3	
• prostate	6	20	7	23.3	
• ovary	2	6.6	1	3.3	
• others	2	6.6	0	0	
<b>2. Body mass index</b>					
• Low weight < 20	4	13.3	3	10	<b>.215<sup>ns</sup></b>
• Standard level of weight (20 < 26 kg)	12	40.0	13	43.3	
• Over weight (26 < 30kg )	8	26.8	9	30	
• Obese (30 < 40kg)	4	13.3	4	13.3	
• Morbid obesity( > 40)	2	6.6	1	3.3	

Chi square test, <sup>ns</sup> non statistically significant difference p. value > 0.05.



Chi square test, \* statistical significant difference,  $P. < 0.05$ . (N.=30)

**Fig (3): Percentage distribution of venous thromboembolism risks level among the patients with cancer undergoing surgery (N. =30)**

**Table (1):** Showed that; more than half of nurses their age ranged from 20 - 30 years (63.3%) with mean of  $(25.7 \pm 5.79)$ . Majority of the nurses were females (96.7%), had technical institute of nursing (53.3%). Three quarter of the nurses (73.3%) their years of experience was less than 5 years with Mean of  $(1.6 \pm 0.48)$ . More than half of the studied nurses were married and not attended training programs regarding VTE risks among the patients with cancer undergoing surgery (56.7% and 60 % respectively).

**Figure (1):** Show that; a statistically significant difference between nurses' knowledge level of mean scores pre and post application of the nursing protocol with mean  $\pm$ SD  $14.36 \pm 6.25$  and  $28.33 \pm 3.25$  with p. value = 0.001\*\*.

**Figure (2):** Showed that; there was a statistically significant difference between the total nurses practice level of mean scores pre and post application of the nursing protocol with p. value  $< 0.001$ \*\*. In addition, the figure showed a significance improvement of the total practice level after application of the nursing protocol. The pre-test mean practice scores were  $25.63 \pm 14.49$  and improved to  $44.53 \pm 6.79$  degrees

**Table (2):** Showed that; there was no statistically significant difference was found between total nurses' knowledge mean scores in relation to all demographic characteristics of the studied nurses except in training courses with p. value 0.050. No statistically significant difference was found between total practice mean scores of nurses and their demographic characteristics except in training courses in which

there was a significant statistical difference post implementing nursing protocol with p. value = 0.011\*.

**Table (3):** Showed that, there was no statistically significant difference between study and control groups regarding their demographic characteristics, in addition that the highest percentage among the studied patients for both study and control groups were aged from 41 to 49 years old, near half of them (53.3 and 50% respectively) were females, vast majority of them (86.6 and 83.3% respectively) were married, and most of them (73.4 and 76.7% respectively) were illiterate. Concerning occupation and residence majority of them (90.0 and 83.3% respectively) were not working, and (90.0 and 83.3% respectively) of them were living in rural area.

**Table (4):** Found that there was no statistically significant difference between study and control regarding their medical data. The table also showed that, the major cancer sites were bladder, colon, breast and prostate in both study and control groups with percentage (20 and 23.3% respectively) for each. In addition, the table demonstrated that; less than half of patients (40.0 and 43.3% respectively) were in standers level of weight ( $20 < 26$  kg) as body mass index.

**Figure (3):** Illustrated that there was a statistically significant difference between study and control groups regarding the VTE risks level post application of the nursing protocol. In addition, around half of the study group patients had intermediate VTE risks (48%) while 40% had a high risk among the control group patients post application of the nursing protocol.

## Discussion

Venous thromboembolism (VTE) represents one of the most important causes of morbidity and mortality among patients with cancer. The absolute risk depends on tumor type, stage of disease, administration of chemotherapy and/or hormone therapy, surgical intervention, the presence of an indwelling central venous catheter, age, immobilization and previous history of VTE. The use of bevacizumab increases the risk of developing VTE (Rose, 2017).

The pathogenesis of VTE is multifactorial. A comprehensive understanding of the pathogenesis of VTE in cancer would allow identification of those at increased risk for VTE who could potentially benefit from the preventive measures (Moffat et al., 2019).

The present study aimed to assess the effect of nursing protocol on nurses' performance and venous thromboembolism risks among patients with cancer undergoing surgery. In general, the current study found that the designed nursing protocol application had a statistically significant beneficial effects in improvement of the studied nurses' knowledge and practice level and minimizing venous thromboembolism risks among the patients with cancer undergoing surgery.

### Regarding nurses

The results of the present study showed that the highest percentages of nurses their age ranged from 20-30 years and had institute of nursing, and female. The majority of nurses are married and the highest percentage of them were not attended training programs. More than three quarters of the studied nurses, their years of experience were less than 5 years. This study result supported with Badawy et al., (2016) they documented that patients with cancer undergoing surgery requires trained and updated professionals, which enable them to prevent and deal with VTE.

Also, Shahin et al., (2018) said that the percentage of the nursing team exceeding majority were females because males contingent in nursing showing a current trend and the majority of students in nursing schools and institutes were mainly females.

In the present study, the majority of nurses had unsatisfactory level of knowledge before designed nursing protocol application regarding, routine nursing cares given to patients with cancer undergoing surgery, precautions must be met to avoid VTE. A significance statistical difference between nurses' knowledge scores pre & post implementation of the nursing protocol.

This may due to that most nurses pre the nursing protocol application gained their knowledge gained from their practice while working with patients. There was no Arabic source for updating and continuing

their education. In addition, this may be attributed to lack of continuous education and absence of in-service training program.

In this regards, Kuderer et al., (2006) stressed on providing standard nursing care for the patients with cancer undergoing surgery is grounded on knowledge to prevent of VTE and care for such group of patients. After implementation of the nursing protocol, the nurses' knowledge score levels were significantly improved. This improvement due to the fact that all nurses had a strong desire to learn new knowledge. Most nurses were young; this age might have a good readiness for learning new things. These results were in agreement with those of Kable et al., (2018) who noted that, generally, nurses' knowledge scores were higher among younger and newly graduated, nurses who attending training program.

The results of the present study showed no significant relation between the scores of nurses' knowledge & practice and their experience observed during the pre the nursing protocol application. This may be attributed to lack of continuous education and in-service training program. These results agreed with Ma et al., (2018) in the study entitled "Impact of workplace incivility in hospitals on the work ability, career expectations and job performance of Chinese nurses: A cross-sectional survey", who stated that young age nurses at oncology department had the capability to gain knowledge and alter their performances.

The current study showed inadequate level of total practice scores in all items pre implementation of the nursing protocol. This may be due to all nurses did not have enough information about absence of nursing care related to identification, prevention and management of VTE among the patients cancer undergoing surgery.

The current study revealed a significant improvement in the practice score level obtained by nurses after implementation of the nursing protocol in all items. Evidenced by a significance difference between results of pre and post-test. This finding indicated that skills can be easily improved, especially if linked with their relevant scientific base of knowledge.

The researcher opinion that, the professional literature was not available to the nurses in the workplace. They added that the lack of time was regarded as a barrier to applying research to practice

In this respect, Khorana et al., (2016) mentioned that; leaders and managers must see that subordinates know and understand the standards and employee must be aware that their performance will be measured in terms of their ability to meet the established outcomes.

Mantha et al., (2017) were in the same line with the current study findings, who revealed that an

improvement in nurse`s practice after attending a continuing nursing education sessions. Research findings indicated that continued nursing education programs increase both knowledge and practice. In addition nursing protocol should be organized according to the needs of nurses with continuous evaluation and adopting proper checklists for work monitoring to enhance staff awareness; reduced process errors, mitigating overall risks, eventually resulting in effective patient care.

The researcher point of view that Such structured education will improve the knowledge and practice of staff nurses. Suitable intervention packages need to be developed and in service education need to be given periodically for the effectiveness of qualitative nursing services

Finally, it can be concluded that, the nursing protocol for nurses to identification, prevent and care of venous thromboembolism among cancer surgery patients achieved its objectives by improving nurses` performance (knowledge and practice) regarding venous thromboembolism for cancer surgery patients. Also, **Streiff, (2016)** stated that professional nurses have a large role to play in the minimization & prevention of early and late complications should be clinically well versed in all aspect of the condition, current strategies to address risk minimization and prevention management and advocates for patient safety.

#### **Regarding the studied patients**

The present study revealed that there was no statistically a statistically significant difference between study and control groups and their demographic and medical data. This was important to ensure comparability of the two groups, and indicate successful randomization of the two groups. This confirmed by **Boonchoo et al., (2019)** who documented that it is of paramount importance to ensure equivalence of the groups at the beginning of the experiment to avoid bias basis of some variable known to influence outcomes, such as baseline reading ability or gender.

The present study revealed that the majority of the studied patients in the age range of 41 - 49 years. This result disagreed with **Jarvandi et al., (2016)** who mentioned in their study, that two thirds of all newly diagnosed patients with cancer were in the age 55 years older and this can be attributed to the beginning of generic period of life. According to **Coa et al., (2015)** younger patients were more likely than older patients to report chemosensory alterations, which may be attributable to olfactory and gustatory functions diminishing with age.

In the present study, the majority of patients were married. This opposite to **Afzal et al., (2020)** study on patients with cancer", single patients were at

significantly higher risk of presentation with metastatic cancer, VTE, and death resulting from their cancer.

The present study showed that major cancer sites were bladder, colon, breast and prostate. The researchers' opinion, the nature and location of the cancer, as well as the type of surgery involved, are thought to affect the level of VTE risks. Furthermore, identifying cancer and surgical site is very important and one of risk factors that effect on VTE score.

In this respect, **Lyman et al., (2017)** in the study of "Vascular Complications of Cancer and Cancer Therapy" concluded that cancer types with the highest risk of developing VTE include pancreatic, and gastric. In particular, the relative risk of developing a VTE while hospitalized was increased 4.3-fold for patients with pancreatic cancer compared with patients without cancer.

In this line, **Lee, (2018)** explained that; the genesis of thrombosis in malignancy is complicated, and reflects the interaction and derangement of multiple molecular pathways.

The present study showed that one third of the studied patients was at a standard level of body weight. This confirms the opinion of **Scholz et al., (2015)** who concluded that dietary habits at the time of diagnosis may affect prognosis, at least for patients with cancers.

**Blair et al., (2019)** reported that; historically, weight loss in patients with cancer has been the concern because of the association with poor prognosis. There is an adverse relationship between BMI change and prognosis for patients with cancer and consequently patients likely to gain weight and are in need for nutritional advice on how to avoid gaining weight. This highlights a shift in the relationship between cancer and weight (**Mayanagi et al., 2017**).

The present study illustrated that there was a statistically significant difference between study and control groups regarding the VTE risks level post application of the nursing protocol with p. value 0.010\*. In addition, around half of the study group patients had intermediate VTE risks while two thirds of the control group had a high risk level post application of the nursing protocol.

This results comparing to previous studies which showed that, in Egypt, more than one-third of all patients hospitalized for cancer surgery or acute medical conditions are at high risk for developing VTE (**Goubran et al., 2012**).

The researcher point of view that, this results may be due to the significance increase in the nurses' performance regarding VTE risks identification, prevention and management which help in early detection and decrease the level of risks among the patients with cancer undergoing surgery.

In this admiration, **Hernández-Gea et al., (2019)** reported that; Egyptian patients enrolled in exhibit nearly the same features as compared to the global study. In both the global and Egyptian studies, surgical patients with cancer make up a slightly higher percentage of high-risk patients than do medical patients.

On both the international and Egypt-specific levels, there was substantial room for improvement to achieve a goal of 100% prophylaxis compliance, as only 30-50% of high-risk patients received any preventative care (**Kingue et al., 2014**).

While, **Danwang et al., (2017)** mentioned that; VTE is a leading cause of hospital-related deaths worldwide. However, the proportion of patients at risk of VTE who receive appropriate prophylaxis in Egypt is unknown.

**The researchers opinion that,** the importance of translational simulation in healthcare stating that the “training of individuals and teams in communication, technical skills and teamwork is necessary for improved patient safety and outcomes. Finally, educational intervention in patients with cancer who undergoing surgery significantly improved patient outcomes and showed a reduction in VTE risks and reinforcing the simulation-based education provides a valuable adjunct in residency education.

#### **Limitation of the study**

- The staff working in the departments were not able to provide the sufficient assistance to the researcher because they were overload with their own responsibilities, the researcher overcome of this through making a schedule for each group of nurses.
- The sample size was small and from the limited setting, leading to restrictive the value of the findings.

#### **Conclusion**

The existing study exposed that, the mean score of total nurses' knowledge and practice were significantly increased after the intervention of nursing protocol. The implementation of the nursing protocol had statistically significant improvement on nurses' knowledge and practice. No significant difference found between total nurses' knowledge and practice scores in relation to all demographic characteristics of nurses except in training courses post intervention of nursing protocol. In addition to, The implementation of the nursing protocol had statistically significant improvement on nurse's knowledge and practice. There was a statistically significant difference between both groups regarding venous thromboembolism risks with significantly diminished among study than control group.

#### **Recommendations**

Based on the finding of the present study the following recommendations are suggested:

1. Continuous in service training programs regarding the suggested nursing protocol for detection, prevention and management of VTE among the patients with cancer undergoing surgery were highly recommended to raise the standards of nursing care given to such group of patients.
2. Continues updating and refreshing the nurses' knowledge and practice through workshops which emphasizing on the evidence-based practices to improve their knowledge which will reflect on their practice which lead to prevent venous VTE among the patients with cancer undergoing surgery.
3. Prepare Arabic source for updating and continuing their education.
4. Reapplication of the study on a larger sample selected from different geographical areas of Egypt is recommended to generalized the study results, taking in to consideration the present limitations.

#### **Declaration of conflicting interests**

The authors declare that there is no conflict of interest

#### **Funding**

The authors declare that they have not received any direct or indirect funding from any organization for the research.

#### **Acknowledgments**

We would like to thank all the nurses and patients in Oncology department at Assiut University Hospital for their efforts to complete this research.

#### **References**

1. **Afzal, A., Suhong, L., Gage, B., Schoen, M. W., Carson, K., Thomas, T., & Sanfilippo, K., (2020).** Splanchnic vein thrombosis predicts worse survival in patients with advanced pancreatic cancer. *Thrombosis Research*, 185, 125-131.
2. **Ahamed, N., (2012):** Deep Vein Thrombosis and Pulmonary Embolism. Available at SSRN 1999673.
3. **Assiut University Hospital statistical records, (2019).**
4. **Badawy, S., Rychlik, K., & Sharathkumar, A., (2016):** Current practice of pharmacological thromboprophylaxis for prevention of venous thromboembolism in hospitalized children: a survey of pediatric hemostasis and thrombosis experts in North America. *Journal of pediatric hematology/oncology*, 38(4), 301-307.

5. **Berridge, B., Mowat, V., Nagai, H., Nyska, A., Okazaki, Y., Clements, P. J and Wells, M., (2016):** Non-proliferative and proliferative lesions of the cardiovascular system of the rat and mouse. *Journal of toxicologic pathology*, 29(3), 1S-47S.
6. **Blair, C., Wiggins, C., Nibbe, A., Storlie, C., Prossnitz, E., Royce, M., & Hill, D., (2019):** Obesity and survival among a cohort of breasts is partially mediated by tumor characteristics. *NPJ breast cancer*, 5(1), 1-7.
7. **Boonchoo, K., Leelataweewud, P., Yanpiset, K., & Jirarattanasopha, V., (2019):** Simplify pulpectomy in primary molars with a single-file reciprocating system: a randomized controlled clinical trial. *Clinical oral investigations*, 1-9.
8. **Brown, S., (2014):** Evidence-based nursing: The research-practice connection. Jones & Bartlett Publishers. 3<sup>rd</sup> ed., 351.
9. **Cascio, V., Hon, M., Haramati, L., Gour, A., Spiegler, P., Bhalla, S., & Katz, D., (2018):** Imaging of suspected pulmonary embolism and deep venous thrombosis in obese patients. *The British journal of radiology*, 91, (1089), 956.
10. **Coa, K., Epstein, J., Ettinger, D., Jatoi, A., McManus, K., Platek, M., & Moskowitz, B., (2015):** The impact of cancer treatment on the diets and food preferences of patients receiving outpatient treatment. *Nutrition and cancer*, 67(2), 339-353.
11. **Danwang, C., Temgoua, M., Agbor, V., Tankeu, A., & Noubiap, J., (2017):** Epidemiology of venous thromboembolism in Africa: a systematic review. *Journal of Thrombosis and Haemostasis*, 15(9), 1770-1781.
12. **Dubois, C., D'Amour, D., Pomey, M., Girard, F., & Brault, I., (2013).** Conceptualizing performance of nursing care as a prerequisite for better measurement: a systematic and interpretive review. *BMC nursing*, 12(1), 7.
13. **Elhayeg, O., Abdelhafez, A., & Beshta, M., (2018):** Evaluation of Prophylaxis and Management of Venous Thromboembolism in Surgical Cancer Patients. *The Egyptian Journal of Hospital Medicine*, 72(3), 4143-4148.
14. **Falanga A., Russo L., Milesi V., & Vignoli A., (2017):** Mechanism and risk factor of thrombosis in cancer, *Critical Reviews in Oncology, Hematology*, 118, 79–83.
15. **Gashi, Y., Elgenaid, S., Suliman, H., & Abdalrahman, I., (2018):** Knowledge, attitude and practice of orthopedic registrars toward prophylaxis of venous Thromboembolism". *International Journal of Current Research in Life Sciences*, 7(09), 2735-2738.
16. **Goubran, H., Sholkamy, S., El-Haddad, A., Mahmoud, A., Rizkallah, M., & Sobhy, G., (2012):** Venous thromboembolism risk and prophylaxis in the acute hospital care setting: report from the ENDORSE study in Egypt. *Thrombosis Journal*, 10(1), 20.
17. **Grandoni, F., & Alberio, L., (2019):** Direct oral anticoagulant drugs: On the treatment of cancer-related venous thromboembolism and their potential anti-neoplastic effect. *Cancers*, 11(1), 46.
18. **Helsinki F., (1996):** World medical association declaration of Helsinki , Recommendations guiding physicians in biomedical research involving human subjects, Adopted by the 18<sup>th</sup>World Medical Assembly, 17c.
19. **Hernández-Gea, V., De Gottardi, A., Leebeek, F., Rautou, P., Salem, R., & Garcia-Pagan, J., (2019):** Current knowledge in pathophysiology and management of Budd-Chiari syndrome and non-cirrhotic non-tumoral splanchnic vein thrombosis. *Journal of hepatology*, 71(1), 175-199.
20. **Inzucchi, S., Bergenstal, R., Buse, J., Diamant, M., Ferrannini, E., Nauck, M., & Matthews, D., (2012):** Management of hyperglycaemia in type 2 diabetes: a patient-centered approach. Position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetologia*, 55(6), 1577-1596.
21. **Janice L., & Kerry H., (2018):** Brunner & suddarth's text book of medical –surgical nursing; 14<sup>th</sup> ed., chapter 15, printed in India :Wolters kluwer, 326-337:338.
22. **Jarvandi, S., Pérez, M., Schootman, M., & Jeffe, D., (2016):** Pre-Existing Diabetes in Early Stage Breast Cancer Patients is Associated with Lack of Improvement in Quality of Life 2 Years After Diagnosis. *International journal of behavioral medicine*, 23(6),722-729.
23. **Kable, A., Levett-Jones, T., Arthur, C., Reid-Searl, K., Humphreys, M., Morris, S., & Witton, N., (2018):** A cross-national study to objectively evaluate the quality of diverse simulation approaches for undergraduate nursing students. *Nurse education in practice*, (28), 248-256.

24. **Kearney J., Rossi S., Glinert K., & Henry D., (2009).** Venous thromboembolism (VTE) and survival in a cancer chemotherapy outpatient clinic: a retrospective chart review validation of a VTE predictive model, 114., 2503
25. **Khorana, A., Carrier, M., Garcia, D., & Lee, A., (2016):** Guidance for the prevention and treatment of cancer-associated venous thromboembolism. *Journal of thrombosis and thrombolysis*, 41(1), 81-91
26. **Kingue, S., Bakilo, L., Mvuala, R., Minkande, J., Fifen, I., Gureja, Y., & Rajaonera, T., (2014):** Epidemiological African day for evaluation of patients at risk of venous thrombosis in acute hospital care settings. *Cardiovascular journal of Africa*, 25(4), 159.
27. **Kuderer, N., Dale, D., Crawford, J., Cosler, L., & Lyman, G., (2006):** Mortality, morbidity, and cost associated with febrile neutropenia in adult cancer patients. *Cancer*, 106(10), 2258-2266.
28. **Kulkarni, A., Salvi, R., & Naik, N., (2019):** Effect of Intermittent Pneumatic Compression Device (IPCD) Versus Graduated Compression Stockings (GCS) for Venous Thromboembolism Prophylaxis (VTE) in High Risk Surgical Patients. *Indian Journal of Public Health Research & Development*, 10(11). 234-237.
29. **Lee, A., (2018):** Overview of VTE treatment in cancer according to clinical guidelines. *Thrombosis research*, 164, S162-S167.
30. **Li, H., Jiang, G., Bölükbas, S., Chen, C., Chen, H., Chen, K., & Gilbert, S., (2018).** The Society for Translational Medicine: the assessment and prevention of venous thromboembolism after lung cancer surgery. *Journal of thoracic disease*, 10(5), 3039.
31. **Lyman, G., Catino, A., & Ky, B., (2017):** Vascular Complications of Cancer and Cancer Therapy. In *Cardio-Oncology*. Springer, Cham. 215-240
32. **Ma, C., Meng, D., Shi, Y., Xie, F., Wang, J., Dong, X., & Sun, T., (2018):** Impact of workplace incivility in hospitals on the work ability, career expectations and job performance of Chinese nurses: A cross-sectional survey. *BMJ open*, 8(12), 98-99.
33. **Mantha, S., Laube, E., Miao, Y., Sarasohn, D., Parameswaran, R., Stefanik, S., & Soff, G., (2017):** Safe and effective use of rivaroxaban for treatment of cancer-associated venous thromboembolic disease: a prospective cohort study. *Journal of thrombosis and thrombolysis*, 43(2), 166-171.
34. **Mayanagi, S., Tsubosa, Y., Omae, K., Niihara, M., Uchida, T., Tsushima, T., & Yasui, H., (2017):** Negative impact of skeletal muscle wasting after neoadjuvant chemotherapy followed by surgery on survival for patients with thoracic esophageal cancer. *Annals of surgical oncology*, 24(12), 3741-3747.
35. **Moffat, G., Epstein, A., & O'Reilly, E., (2019):** Pancreatic cancer—A disease in need: Optimizing and integrating supportive care. *Cancer*, 125(22), 3927-3935
36. **National Cancer Institute (2018):** Targeted Cancer Therapies". [cancer.gov](http://cancer.gov)
37. **Onianwa P., Aonge T., Otegbayo J., Ike E., Chukura F., Are O., Akani O., Ayorinde M., Dubi I., & Yaya O., (2017):** Pain as 5th sign, Impact of pain assessment training program on Nigerian nurses knowledge of pain management, *International Nursing and midwifery*, vol (9), 129-135.
38. **Rose, P., (2017):** Risk Factors for Venous Thromboembolism. *Handbook of Venous Thromboembolism*, 1-12.
39. **Scholz, C., Andergassen, U., Hepp, P., Schindlbeck, C., Friedl, T., Harbeck, N., & Rack, B., (2015):** Obesity as an independent risk factor for decreased survival in node-positive high-risk breast cancer. *Breast cancer research and treatment*, 151(3), 569-576
40. **Shahin, M., Abdrbo, A., & Bayoumy, S., (2018):** Effect of Personal and Working Characteristics on Staff Nurses' Leadership Behaviors in Acute Care Setting. *American Journal of Nursing*, 7(6), 281-286.
41. **Streiff, M., (2016):** Thrombosis in the setting of cancer. *ASH Education Program Book*, (1), 196-205.
42. **Walker B., Colledge N., Raston S., & Peman I., (2014):** Assessment and management of clinical problem, chapter (18), principles and practice of medicine, 22<sup>nd</sup> ed, Elsevier, 604.