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Assessment of adherence to National Comprehensive Cancer Network guideline recommended anticoagulant therapy in the management of patients with cancer-associated venous thromboembolic disease

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ORIGINAL STUDY

Assessment of Adherence to National Comprehensive Cancer Network Guideline Recommended Anticoagulant Therapy in the Management of Patients with Cancer-associated Venous Thromboembolic Disease

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Abstract

Background: **Venous thromboembolism (VTE), a vascular disorder, is a serious and sometimes fatal problem, ranking as the second-deadliest complication for people with cancer. VTE includes pulmonary embolism, superficial vein thrombosis, deep vein thromboembolism, and internal vein thrombosis. It is important to note that cancer patients have almost nine times higher odds of dying from this illness.**

Objective: **The Najaf Cancer Center conducted a study to evaluate the effectiveness of oncologist strategies in the prevention and treatment of cancer-associated venous thromboembolism (VTE). The primary objective was to measure the adherence of VTE patients to anticoagulant therapy recommended by the NCCN guidelines.**

Method: **Conducting a one-of-a-kind investigation from the period of November 2022 to March 2023, the Middle Euphrates Cancer Center in Najaf Governorate, Iraq, is embarking on an extraordinary endeavor. Split into two distinct phases, an observation phase and an intervention prospective phase with a focus on an educational program, this groundbreaking study will involve a group of 100 patients. These patients, who have undergone treatment in hospitals and outpatient clinics and are over the age of 18, consist of both post-educational and pre-school individuals. Adopting the renowned NCCN guidelines and the Khorana risk score, this study aims to evaluate the risk score of patients with different types of cancer by implementing a well-established questionnaire.**

Result: **After completing the educational program, the prescription of anticoagulants for patients experienced a notable boost, increasing from a mere 6%−13%. The assessment of adherence to the Cancer-associated VTE prophylaxis or treatment guideline categories revealed an interesting alteration in four of the categories following the program, while the other three categories showed no meaningful change. Nonetheless, when taking into account all seven categories, the overall adherence score saw a substantial improvement from 1.42 points prior to the program to 3.86 points afterwards ($P < 0.05$).**

Conclusion: **According to the final evaluation, an improvement is observed in the Adherence of oncologists to NCCN guideline recommendations after the educational program.**

Keywords: Cancer, Venous thromboembolism, Anticoagulant therapy, NCCN guideline, Risk score assessment, Adherence

1. Introduction

Cancer patients aren't got it easy− compared to the general population, they're more prone to VTE [1]. But what makes matters worse is that, if their condition recurs, their mortality rate sky-rockets [2,3]. According to research, they're at a 9x higher risk of falling ill with this blood clotting

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sickness. Analysis of health claims showed that 12.6% of cancer-ridden chemotherapy patients had VTE within one year versus only 1.4% without cancer in the control group! Factors like chemotherapy, anti-angiogenic therapy, protein kinase inhibitors and immunotherapy have been linked to increasing the likelihood of VTE as well [4,5]. When it comes to cancer patients, thrombosis is the second leading cause of death–almost as bad as the disease itself [6]. A bunch of research papers prove that if cancer patients get VTE, their chances of survival are harsh and their risk of dying is hiked up 2–6 times compared to those who don't get VTE [7,8]. So essentially, in terms of cancer patients, VTE is a serious problem with potentially deadly results [9,10]. Venous thromboembolism, or VTE, is a major risk many surgical patients face—and death. Everything from medical conditions to cancer treatments can all contribute to its likelihood. Consequently, it's really important to identify who's at high-risk for VTE and make sure they get the best possible preventative care [11,12]. Multiple studies have confirmed that both inpatient and outpatient cancer patients are far more likely than others to develop VTE [5,9,13–15]. Khorana's Risk Score System is the go-to for discerning the probability of developing a Venous Thromboembolism disorder. Primary cancer sites like lung, lymphoma, gynecological, bladder or testicular are huge red flags when it comes to increased risk. Additionally, platelet count of 350,109/L or more, WBC 11,109/L or higher, HGB 10 g/dl or lower, growth factor medication and BMI over 35kg/m2 pre-chemotherapy are warning signs as well [16]. The American Society of Clinical Oncology's official stance doesn't back the idea of giving all cancer outpatients anticoagulation medication as a way to prevent Venous Thromboembolism. The only people they say should get it are those with Khorana risk scores of two or higher, according to ESCMO, NCCN, and ASH [17–21] (see Table 1-4, Fig. 1).

Table 1. VTE risk factor in patients with cancer according to (NCCN guideline).

Risk factors associated with patients	Advanced age Overweight (modifiable) Tobacco use and smoking (modifiable) Level of activity/exercise (modifiable) Hypercoagulability inherited or acquired. Infect. kidney disease. Lung disease. heart failure, arterial thromboembolism Previous VTEs Hospitalization and prolonged immobilization. poor performance
Factors Associated with Cancer Risk	active cancer advanced cancer Cancer Types at Increased Risk o Pancreas, o Brain, o Bladder, o Stomach, Gynecology, o Lung, o Lymphoma, o Kidney metastatic malignancy
Treatment-Related Risk Factors	major surgery chemotherapy protein kinase inhibitor Immunotherapy exogenous hormone therapy anti-angiogenic agent Central Venous Catheters/IV Catheters

Table 2. The Khorana score for venous thromboembolism associated with malignancy [22].

Patient characteristics	Risk score
location of cancer	
Very high-risk "stomach, pancreas"	2
High risk “Lung, Lymphoma, Gynecology, Bladder, Testicle".	1
Platelet count should be at least 350 × 109/l before chemotherapy	1
Hemoglobin level below 10 mg/mL or taking red blood cell growth factor	1
It was found that the white blood cell count was higher than 11 × 109/l before chemotherapy	1
BMI ≥35 kg/m^2	1

High risk score, ≥3, medium risk score, 1–2, low risk score, 0.
BMI, body mass index.

2. Risk assessment

It goes without saying that evaluating cancer-related venous thromboembolism (VTE) requires more than a one-dimensional approach. To get an accurate assessment and prediction, you gotta think about multiple factors [11]. So, this guideline proposes using Khorana score to assess the likelihood of VTE in cancer patients that just started therapy. It's been around for over 10 years now and underwent multiple validation trials since then. During these tests, we looked into different clinical and laboratory variables, such as type of cancer, components of blood count, and body mass index (BMI) to determine prognostic factors [22].

In a recent study on thromboprophylaxis, a minimum of ≥2 was used as an indicator of suitability [23,24].

3. Biological mechanisms of cancer-related thrombosis

Tumor cells are engaged in the complex etiology of cancer-associated venous thromboembolism (VTE), playing a role in activating coagulation pathways, starting inflammatory processes, blocking fibrinolytic activity, and promoting platelet

Table 3. Characteristics of a range of risk assessment tools used to assess VTE in cancer patients.

Risk score	The attributes of variables/and the population/under consideration were incorporated into the study.	External validation	This criterion is employed to determine the appropriate candidates for thromboprophylaxis.?
Khorana [22]	"original"	+++	yes "review"' Yes, "prospective randomized study".
Vienna (2010) [25]	In addition, D-dimer, sP-selectin	–	–
PROTECHT [26]	The body mass index (BMI) is eliminated, while chemotherapy is incorporated.	–	–

aggregation. Malignancy and the hemostatic system interact intricately, which encourages the production of clots and bleeding. Blood clot risk in a patient is determined by a variety of clinical factors, procoagulant biological processes, and particular cancer features. Multiple signaling pathways are involved in the development of VTE in connection to malignancy.

4. VTE prevention in cancer patients

5. Anticoagulant therapy is administered to treat venous thromboembolism. According to NCCN guidelines

Direct oral anticoagulant:

- **Apixaban**
  - Administering the reduced dosage of 5 mg orally every 12 h is recommended after the initial duration of 7 days when 10 mg orally was taken.

Table 4. NCCN recommendations for VTE prevention in hospitalized medical oncology patients.

agent	standard dose	kidney dose	Dosage for obesity (BMI ≥40 kg/m2)
Dalteparin	5000 units of SC per day	Avoid if CrCl <30 mL/min	7500 units of SC per day or 5000 units of SC every 12 h or 40–75 units/kg s.c. daily
Enoxaparin	40 mg daily subcutaneously	If CrCl <30 mL/min, 30 mg subcutaneously daily is recommended	Consider 40 mg subcutaneously every 12 h or 0.5 mg/kg daily subcutaneously
Fondaparinux	2.5 mg subcutaneously per day. Avoid use in patients weighing <50 kg	Be careful with CrCl at 30–49 mL/min. Avoid if CrCl <30 mL/min	Consider subcutaneous injection of 5 mg daily
United Family Hospital	5000 units SC every 8–12 h	Equivalent to standard dose	Consider using 7500 SC units every 8 h

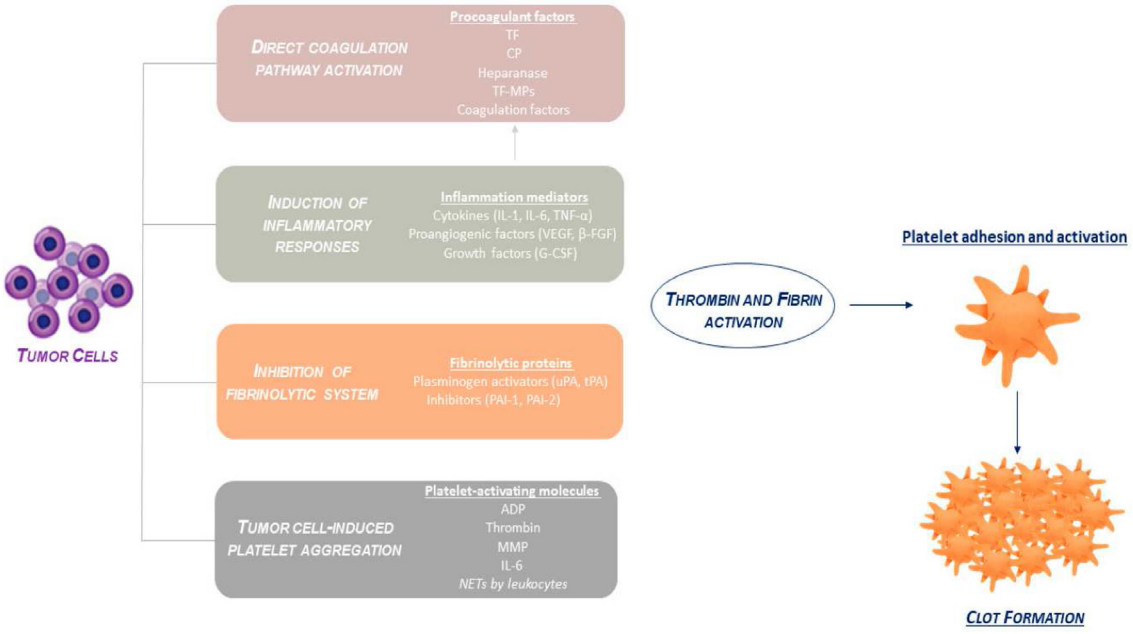

Figure 1. interaction mechanism between cancer cell and thrombus formation [27].

- **Edoxaban**
  - To effectively treat the condition, patients are advised to start with either LMWH or UFH for a minimum of five days. After finishing this initial course, patients should proceed to taking 60 mg of oral edoxaban daily. However, those who have a CrCl of 30–50 mL/min, are under 60 kg of body weight, or are taking strong p-glycoprotein inhibitors should have their dosage decreased to 30 mg per day …
- **Rivaroxaban**

For the first 21 days, it is advisable to take 15 mg orally every 12 h. After that, the dosage should be increased to 20 mg daily.

LMWH (recommended for patients with gastroesophageal or gastric lesions).

- **Dalteparin**
  - The suggested daily dose for a 30-day period is 200 units/kg, administered subcutaneously. Following this initial phase, the dose should then be adjusted to 150 units/kg administered once daily.
- **Enoxaparin**
  - After the first month, it would be advisable to lower the dose to 1.5 mg/kg bw per day. The suggested dosage is one mg/kg body weight given subcutaneously every 12 h.

Direct oral anticoagulant

- **Dabigatran**

For at least five days, it is recommended to take LMWH or UFH. Following this, oral dabigatran should be taken every 12 h at a dosage of 150 mg.

Fondaparinux

- Weights under 50 kg are suitable for the recommended 5 mg subcutaneous dosage.
- The usual dosage recommendation for those weighing between 50 and 100 kg is 7.5 mg per day.
- Recommended daily subcutaneous injection of 10 mg for individuals over 100 kg.

UFH

An initial intravenous (IV) dose of 80 units per kilogram (kg), which should be given as a bolus, is followed by a continuous intravenous infusion of 18 units per kilogram every hour. The activated partial thromboplastin time (aPTT) objective range is 2–2.5 times control values. Subcutaneous (SC) medicine is then administered at a rate of 250 units/kg every 12 h.

- The initial SC dose is advised to be 333 units/kg, with successive doses every 12 h being 250 units/kg …

Warfarin

- Considerations for drug–drug interactions and liver problems should be taken into account when determining the starting dose of warfarin, which is typically 2.5 mg per day. The recommended dose of warfarin to maintain the International Normalized Ratio (INR) between 2 and 3 is 5 mg per day.

LMWH + warfarin options

- Injected daily at a dose of 200 units/kg, dalteparin or 100 units/kg every 12 h, can be administered subcutaneously.
- It is advised to administer enoxaparin subcutaneously once daily at a dose of 1 mg/kg.

Fondaparinux + warfarin

- The daily suggested subcutaneous dose for individuals weighing under 50 kg is 5 mg.
- The prescribed daily subcutaneous dose for individuals between 50 and 100 kg is 7.5 mg.
- For individuals weighing over 100 kg, it is suggested to administer a daily subcutaneous injection of 10 mg.

UFH + warfarin options

- To obtain a goal activated partial thromboplastin time (aPTT) of 2–2.5 times control, it is indicated to administer the medicine intravenously as a bolus dosage of 80 units/kg, followed by a continuous infusion of 18 units/kg/h.
- An initial dose of 333 units/kg SC and subsequent doses of 250 units/kg every 12 h will be given.

6. Methodology

Between November 2022 and March 2023, an intriguing research project unfolded at the Middle Euphrates Cancer Center in Iraq's An-Najaf governorate. Divided into two distinctive stages, this study embarked on an exciting journey: first, an observational phase, followed by an interventional prospective phase which encompassed an educational program.

The research registration number 3055, slated for 4 September 2022, has been approved by the Najaf Health Authority's Scientific Research Committee and the Ethics and Science Committee of the

University of Kufa's Faculty of Pharmacy. In September 2020 and September 2022, they received approval.

A) Observation Phase (Pre-intervention) includes 100 patients hospitalized and ambulatory, with ages more than 18 years. Thereafter, measure the risk score for different types of cancer patients by dependent Khorana risk score according to NCCN guidelines. Furthermore, tacked the demographic data from patients and checked the medical record for each patient for clinical evaluation.

B- Intervention Phase Subsequently, after the observation phase, an educational part and recommendation according to NCCN guidelines, including a lecture and posters, were submitted to the cancer center to oncologists to raise awareness of the seriousness of this disease and how prevention and treatment.

C- post-intervention Phase Take 100 patients who have nearly the same demographic to show developed the practice of oncologists toward the anticoagulant by check us out the medical record for patients.

Statistical analysis. Information on cancer patients and doctors who specialize in cancer treatment was gathered, managed, and analyzed using SPSS version 28, a software package for the social sciences. Descriptive statistics, including counts and percentages, were employed to assess categorical variables. The average, standard deviation, and standard error of a scaled variable, as well as its 95% confidence intervals, were calculated. The characteristics of patients were evaluated based on the amount and percentage of patients. When comparing the characteristics of the two groups before and after the training program, during the initial enrollment, the same results were observed. This methodology sought to eliminate the influence of external factors on the final evaluation and decision-making process. For the prevention or treatment of cancer-related VTE, we carefully studied the patient's medical records in order to make decisions and assessments regarding prevention or treatment. Our total score is 7 points, with each point representing a recommended guideline that was followed. Ultimately, these seven points total seven points. To calculate the average total score, we divided the total score of the seven items by the total number of patients and then compared the average between different patient groups. When contrasting things, we considered the attributes of the variables. To assess the differences between groups, we employed a student's t-test that took into account the scale variables. Significant statistics were determined by performing a paired t-test on within group means. For comparing two populations, a nonparametric test called the Mann–Whitney U test is employed when the variable in question does not follow a normal distribution. The chi-square test is employed to contrast categorical variables, but if the numbers are low or the frequency is 0, then the Fisher's exact test is appropriate to use (see Table 6).

7. Result

After conducting interviews with a cohort of 100 cancer patients, we proceeded with the recruitment process. We then gathered another group of 100 cancer patients following the completion of the training program. The two cohorts displayed strikingly similar attributes such as their general and demographic characteristics, as well as the specifics of their cancer diagnosis, time since diagnosis, treatment received, overall risk score, and level of risk Tables 7–11. Our examination of the patients' medical records unveiled that merely 6 patients (6%) had received anticoagulant therapy prior to participating in the educational program. We discovered that 13% of the patients figure (2) were receiving anticoagulant therapy following the program. The education initiative resulted in significant improvements in adhering to guidelines for preventing or treating cancer-related VTE. Notably, there were significant changes in four categories, whereas the remaining three categories remained unaffected. The average compliance score for all seven categories increased substantially from 1.42 points prior to the training to 3.86 points following the training, representing a noteworthy improvement ($P < 0.05$). This positive outcome is demonstrated in Table (12) and Figure (3) (see Table 13).

8. Discussion

Patients with cancer typically have high levels of morbidity and mortality as a result of the common complication of venous thromboembolism (VTE). These patients may need immediate attention for serious complications that arise from cancer [4]. Our findings have been incorporated into the NCCN Guidelines, which now advocate for the use of evidence-based treatments that are consensus-based. These rules are intended to maximize the best results for patients by ensuring the greatest possible prevention, assessment, treatment and support [28]. Unfortunately, the compliance of patients with the risk assessment and prophylaxis guidelines for VTE is lacking. Our findings, based on the Khorana risk score, demonstrated a higher probability of a high-risk patient in 32 percent of the patients, and in

Table 5. VTE prophylaxis in outpatient medical oncology patients according to NCCN guidelines.

Agent	standard dose	kidney dose	Other dose adjustments
Apixaban	2.5 mg orally twice daily	Avoid if CrCl <30 mL/min.	Avoid if platelet count <50,000/μL Avoid use if you weigh <40 kg.
rivaroxaban	10 mg orally once a day	Avoid if CrCl <30 mL/min.	Avoid if platelet count <50,000/μL
Dalteparin	Then 200 units/kg SC daily x 1 month 150 units/kg SC per day x 2 months	Avoid if CrCl <30 mL/min.	Avoid if platelet count <50,000/μL Avoid use if you weigh <40 kg.
	Then inject 1 mg/kg subcutaneously. daily x 3 months	Avoid if CrCl <30 mL/min.	Reduce dose to 0.5 mg/kg subcutaneously per day
	40 mg daily subcutaneously		Platelet count 50,000–75,000/μL Avoid if platelet count <50,000/μL

Table 6. VTE prophylaxis in inpatient surgical oncology patients according to NCCN guidelines.

agent	standard dose	kidney dose	Dosage for obesity (BMI ≥40 kg/m2)
Dalteparin	5000 units subcutaneously the night before surgery, then 5000 units subcutaneously daily, or 2500 units subcutaneously 1–2 h before surgery, 2500 units subcutaneously 12 h later, then 5000 units subcutaneously daily after the first day of surgery	Avoid if CrCl <30 mL/min	7500 units of SC per day or 5000 units SC every 12 h or 40–75 units/kg s.c. daily
Enoxaparin	40 mg subcutaneously 10–12 h before surgery, then 40 mg subcutaneously daily, or 40 mg subcutaneously daily 6–12 h after surgery, first dose	If CrCl <30 mL/min, 30 mg subcutaneously daily is recommended	40 mg SC every 12 h or 0.5 mg/kg SC daily
Fondaparinux	2.5 mg subcutaneously once daily, as early as 6–8 h after surgery	Use CrCl 30–49 ml/min with caution. Avoid if CrCl <30 mL/min	5 mg daily subcutaneously
United Family Hospital	5000 units of SC 2–4 h before surgery, then 5000 units of SC every 8 h until the first day of surgery	Equivalent to standard dose	7500 units SC every 8 h after surgery
Apixaban	UFH 5000 units SC 30 min before surgery every 8 h until the first day of surgery, then apixaban 2.5 mg PO every 12 h	Equivalent to standard dose	No way to adjust dose

Table 7. General Characteristics of 100 cancer patients

Variable		Before		After		P. value
		No.	%	No.	%	
Age (year)	≤40	12	12.0	10	12.0	0.923
	41–50	17	17.0	21	17.0	
	51–60	35	35.0	33	35.0	
	61–70	23	23.0	25	23.0	
	>70	13	13.0	11	13.0	
Gender	Male	50	50.0	50	50.0	1.00
	Female	50	50.0	50	50.0	
Residence	Najaf	66	66.0	62	66.0	0.902
	Al-Qadisiyah	11	11.0	14	11.0	
	Al-Muthanna	11	11.0	13	11.0	
	Babylon	8	8.0	6	8.0	
	Other	4	4.0	5	4.0	
Occupation	Unemployed	44	44.0	41	44.0	0.772
	Housewife	43	43.0	48	43.0	
	Employed	13	13.0	11	13.0	
Education	Illiterate	44	44.0	41	44.0	0.812
	Primary	26	26.0	23	26.0	
	Secondary	22	22.0	25	22.0	
	University	8	8.0	11	8.0	
BMI	Underweight	4	4.0	2	4.0	0.743
	Normal	44	44.0	47	44.0	
	Overweight	30	30.0	26	30.0	
	Obese	22	22.0	25	22.0	
Medical history	Yes	52	52.0	49	52.0	0.661
	No	48	48.0	51	48.0	
Surgical history	Yes	56	56.0	58	56.0	0.668
	No	44	44.0	42	44.0	

68% of the patients, the probability was increased (Table 5). A cross-sectional study was conducted at the Uyo University Teaching Hospital to describe this issue. The results demonstrated that the majority of participants (71.8%) failed to assess the risk of VTE in patients. Interestingly, only a small percentage (18.8%) actually practiced VTE prevention methods [29]. Another study found that the majority of participants were novices at the Khorana scale, regardless of their prior experience or the hospital environment they were in. Interestingly, only 4% of the participants employed risk assessment tools. The instrument has been modestly popular due to the ongoing debate about its effectiveness. Many studies have produced conflicting results regarding antiqueness, specifically regarding the different types of cancer [30,31]. A national study in France revealed that only a small portion of the participants intended to utilize a VTE risk score (16%) [32]. Meanwhile, a national study in the Netherlands reported that the majority of people who had never received primary prophylaxis in the outpatient setting believed that the probability of having VTE was not sufficiently high to warrant prophylaxis. The infrequent utilization of the Khorana score and the ambiguous nature of the other risk assessment

Table 8. Distribution of the cancer-patients Before and After education programs according to the types of cancer

Types	Before		After	
	No.	%	No.	%
Lung cancer	20	20.0	15	15.0
Gastric cancer	19	19.0	16	16.0
Pancreatic cancer	13	13.0	10	10.0
Gynecological cancers	16	16.0	21	21.0
Lymphomas (HL, NHL)	9	9.0	12	12.0
Bladder cancer	7	7.0	5	5.0
Prostate cancer	5	5.0	5	5.0
Breast cancer	3	3.0	6	6.0
Colon cancer	2	2.0	3	3.0
Others	6	6.0	7	7.0
Total	100	100.0	100	100.0

*Others: AML, kidney, bone, Testis, Vaginal.
P. value = 0.906 not significant.

Table 9. Descriptive statistics of the duration since diagnosis of cancers among the cancer patients before and after the education program

Statistical parameter	Before	After
Mean	7.2 months	7.6 months
SD	1.4 months	1.3 months
Range	One - 11 months	One – 12 months

P. value = 0.903 not significant.

methods suggests that participants employed different methods to assess the risk of VTE in these patients [33]. Participants were more inclined to rely on their own clinical judgment, experience, and clinical practice when deciding on treatments, rather than following protocols exactly Without guidelines regarding the type, dose, and duration of anticoagulants, For cancer-related VTE, the recommended length of anticoagulation is 3–6 months [34]. Adherence lower among participants may be attributed to the fact that they had inconsistent results from clinical studies and didn't concur with the international guidelines on the subject. Additionally, a small number of participants were unaware of the appropriate indication for thromboprophylaxis in this patient population [33]. From September to December 2018, a prospective study involving both inpatients and outpatients with cancer was carried out. For patients who had been admitted, compliance with regulations was monitored throughout their hospital stay. Eight specified criteria created in accordance with National Comprehensive Cancer Network recommendations on cancer-associated venous thromboembolic illness served as the basis for evaluations. Five of the eight predetermined standards had compliance percentages ranging from 59 to 100 percent. Rates for other criteria, in contrast, have continuously been low, ranging from 0% to 1%. When prophylaxis was started on admission and the appropriate dose of anticoagulants was established after these guidelines were put into practice, there was a noticeably higher rate of compliance [35].

This study has several limitations, including that it was conducted at only one center, the Middle Euphrates Cancer Center, Najaf Governorate, Iraq, due to time constraints and the short duration required to conduct the study at a single center and the limited number of oncologists at the center. This

Table 10. Distribution of the cancer patients according to the modality of cancer treatment

	Before		After	
Modality of Treatment	**No.**	**%**	**No.**	**%**
Chemotherapy	49	49.0	52	52.0
Chemotherapy + Surgery	31	31.0	34	34.0
Chemotherapy + Radiotherapy	11	11.0	8	8.0
Chemotherapy + Radiotherapy + Surgery	9	9.0	6	6.0
Total	100	100.0	100	100.0

P. value = 0.729 not significant.

Table 11. Distribution of cancer patients by Khorana scale VTE risk prediction Model's risk stratification data

		Before		After		P. value
		No.	%	No.	%	
Total Risk score	1	20	20.0	21	21.0	0.905 ns
	2	48	48.0	43	43.0	
	3	28	28.0	31	31.0	
	4	4	4.0	5	5.0	
Level of risk	High risk	32	32.0	36	36.0	0.550 ns
	Intermediate	68	68.0	64	64.0	

Total score ≥3 High risk of VTE.
The total score is 1–2. Moderate VTE risk.
Total score 0 low risk.

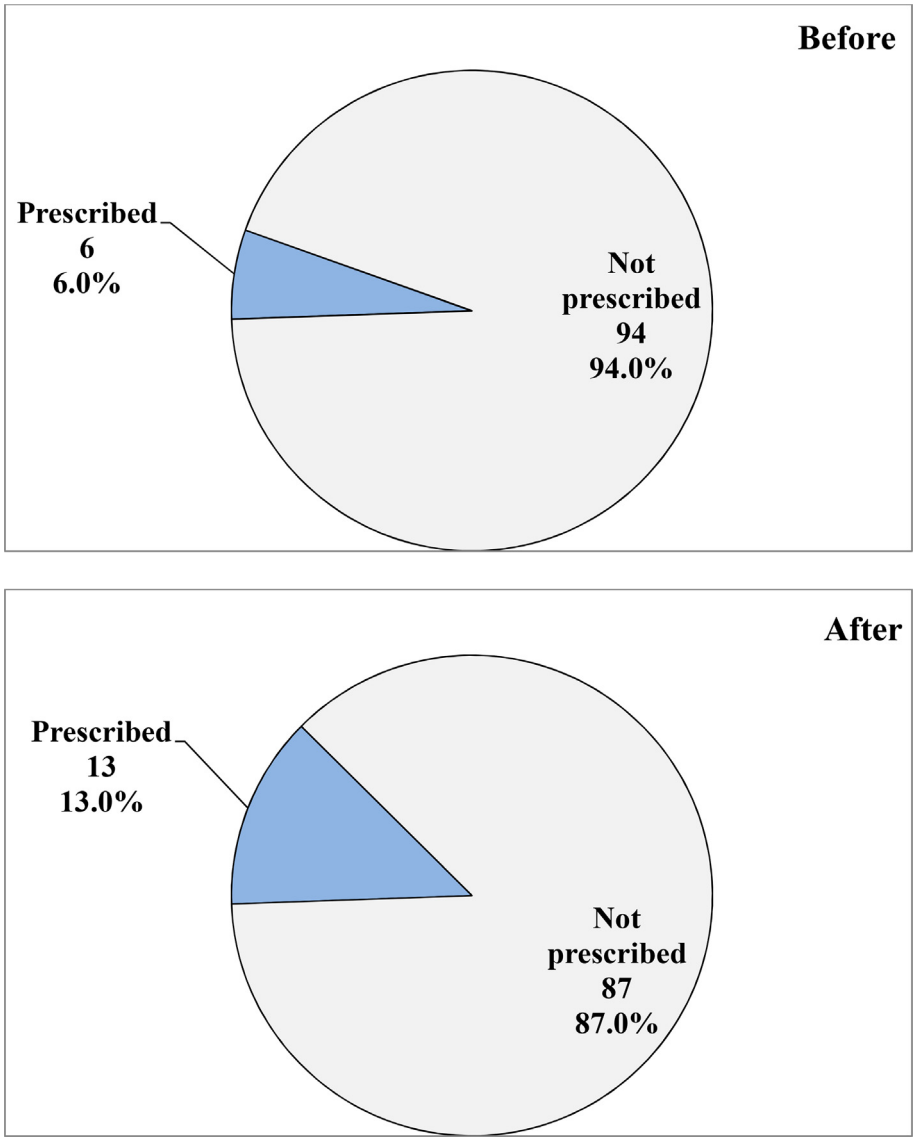

Fig. 2. Rate of Cancer-associated VTE prophylaxis or treatment prescribed to cancer patients (Reported in Patient's medical record) Before and After education program.

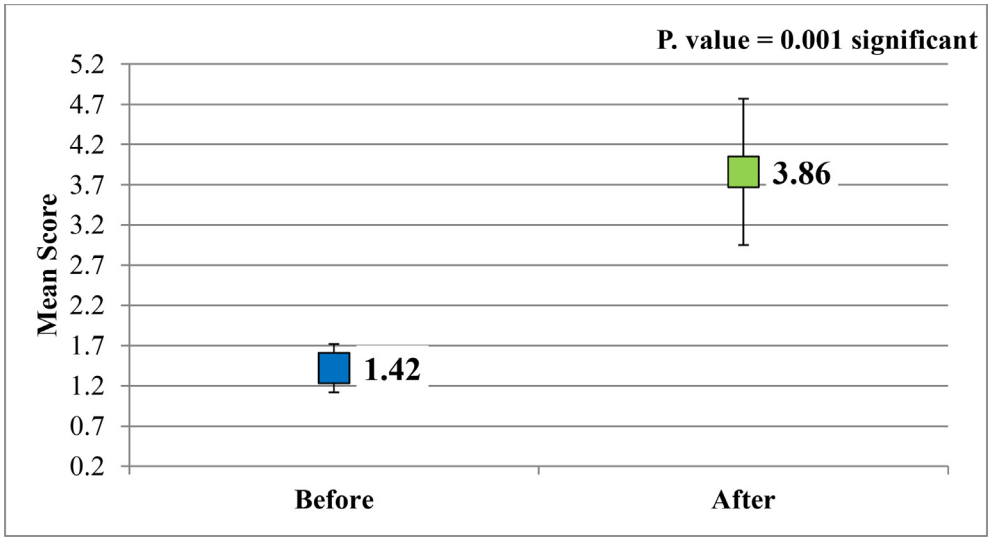

Fig. 3. Upper and lower lines reflect 95% confidence intervals for the mean in a marked line graph comparing oncologists' mean adherence scores before and after recommending VTE treatment and education programs.

Table 12. Clinical assessment and decision-making in compliance with cancer-related VTE prevention or treatment guideline categories

	Yes		No		P. value
	No.	%	No.	%	
Types of Cancer-Related VTE Prevention or Treatment Prescribed According to NCCN Guidelines Recommendations	**6**	6.0	13	13.0	0.047 sig
Cancer-related VTE prophylaxis or treatment doses are recommended in accordance with NCCN guidelines	**2**	2.0	10	10.0	0.017 sig
Cancer-associated VTE prophylaxis or treatment duration prescribed according to NCCN guideline recommendations	**0**	0.0	5	5.0	0.024 sig
Cancer-associated VTE risk assessment was according to NCCN guideline	**0**	0.0	3	3.0	0.081
Routine haemostatic laboratory evaluation at and after diagnosis according to NCCN guidelines	**7**	7.0	11	11.0	0.323
Thromboprophylaxis for patients at high risk of thrombosis	**2**	2.0	9	9.0	0.030 sig
Follow-up with antithrombin assays after diagnosis	**0**	0.0	3	3.0	0.081
Mean Score out of 7 points (SD)	**1.42 (0.52)**		**3.86 (1.7)**		**0.001** sig

Table 13. List of abbreviations

Abbreviations	Meaning
VTE	Venous Thromboembolism
KRS	Korana risk score
BMI	body mass index
NCCN	National Comprehensive Cancer Network""
ESMO	"European Society for Medical Oncology"
ASH	American Society of Hematology""
ASCO	American Society of Clinical Oncology""
DOACs	Direct Oral Anticoagulants
I.V	intravenous
SC	subcutaneous
PO	By mouth or orally
crcl	Creatinine clearance
INR	"International Normalized Ratio"
aPTT	activated partial thromboplastin time""
ufH	"unfractionated heparin"
LMWH	low molecular weight heparin""
TF	Tissue factor
mmHg	Millimeter of Mercury
CP	cancer procoagulant factor
TF-MPS	positive tumor-derived microparticles
IL1, IL2	Interleuken-1, interleuken-2
TNF-α	"tumor necrosis factor a"
VEGF	"vascular endothelial growth factor"
SD	Standard Deviation
BFGF	proangiogenic fibroblast growth factor
SPSS	"Statistical Package for Social Sciences"
UPA	Urokinase-type plasminogen activator
TPA	"tissue plasminogen activator"
PAI-1	"Plasminogen activator inhibitor 1″
PAI-2	"Plasminogen Activator Inhibitor 2″
ADP	Adenosine diphosphate
MMP	matrix metalloproteinases
NETS	neutrophil extracellular traps

(*continued on next page*)

limited outreach to other oncology centers in Iraq. Therefore, further studies with larger sample sizes and multicenter studies are required for further evaluation to improve adherence to the guidelines.

9. Conclusion

According to the final evaluation, an improvement is observed in the Adherence of oncologists to NCCN guideline recommendations after the educational program.

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