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Improved compliance with venous thromboembolism (VTE) pharmacologic prophylaxis for patients with gynecologic malignancies hospitalized for nonsurgical indications did not reduce VTE incidence

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Abstract

Objective—National guidelines recommend prophylactic anticoagulation for all hospitalized patients with cancer to prevent hospital-acquired venous thromboembolism (VTE). However, adherence to these evidence-based recommended practice patterns remains low. We performed a quality improvement project to increase VTE pharmacologic prophylaxis rates among patients with gynecologic malignancies hospitalized for nonsurgical indications and evaluated the resulting effect on rates of development of VTE.

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Methods/materials—In June 2011, departmental VTE practice guidelines were implemented for patients with gynecologic malignancies who were hospitalized for nonsurgical indications. A standardized VTE prophylaxis module was added to the admission electronic order sets. Outcome measures included: number of admissions receiving VTE pharmacologic prophylaxis within 24 hours of admission; and number of potentially preventable hospital-acquired VTEs diagnosed within 30 and 90 days of discharge. Outcomes were compared between a pre-guideline implementation cohort (N=99), a post-guideline implementation cohort (N=127), and a sustainability cohort assessed 2 years after implementation (N=109). Patients were excluded if upon admission they had a VTE, were considered low risk for VTE, or had a documented contraindication to pharmacologic prophylaxis.

Results—Administration of pharmacologic prophylaxis within 24 hours of admission increased from 20.8% to 88.2% immediately following the implementation of guidelines, but declined to 71.8% in our sustainability cohort ($p<0.001$). There was no difference in VTE incidence among the three cohorts ($n=2$ (4.2%) v. $n=3$ (3.9%) v. $n=3$ (4.2%), respectively; $p=1.00$).

Conclusions—Our quality improvement project improved pharmacologic VTE prophylaxis rates. A small decrease in prophylaxis over the subsequent 2 years suggests a need for continued surveillance to optimize quality improvement initiatives. Despite increased adherence to guidelines, VTE rates did not decline in this high-risk population.

INTRODUCTION

More than two million people are diagnosed with a venous thromboembolism (VTE) each year, with over half of these patients diagnosed during hospitalization or within 30 days of discharge.⁽¹⁾ It is estimated that 75% of VTE-associated deaths occur in nonsurgical patients.⁽²⁾ The morbidity and mortality associated with VTE not only is clinically devastating but also is associated with a high economic burden; projected additional costs are \$10,000 - \$20,000 per VTE.⁽¹⁾

Malignancy is a well-recognized risk factor for VTE, and a significant proportion of patients with cancer will be diagnosed with a deep-vein thrombosis (DVT) and/or pulmonary embolism (PE) at some point during the course of their treatment.⁽³⁾ Women with gynecologic cancers represent one of the highest-risk cohorts for developing a VTE.⁽⁴⁻⁶⁾ Clinical consensus guidelines from the American College of Chest Physicians (ACCP)⁽⁷⁾, American Society of Clinical Oncology (ASCO)^(8, 9), National Comprehensive Cancer Network (NCCN)⁽¹⁰⁾, and European Society for Medical Oncology (ESMO)⁽¹¹⁾ recommend pharmacologic anticoagulation prophylaxis during hospitalization for all patients with cancer to prevent VTE. Despite these evidence-based recommendations, implementation of pharmacologic prophylaxis among hospital patients remains low. Survey and surveillance studies show that only 5-37% of medical oncology patients receive recommended VTE prophylaxis.⁽¹²⁻¹⁴⁾

In 2009, we implemented standardized postoperative VTE prophylaxis practice guidelines for all patients undergoing major surgery for gynecologic cancer. This change in guidelines resulted in a 55% reduction in postoperative VTE rates.⁽¹⁵⁾ In 2011, we expanded our guidelines to include VTE prophylactic anticoagulation for patients with a gynecologic

malignancy who were hospitalized for nonsurgical indications. We implemented a quality improvement (QI) project with the objective of increasing VTE pharmacologic prophylaxis rates. In this study, we compare the VTE pharmacologic prophylaxis rates and incidence of VTE before, immediately following, and 2 years after the implementation of the QI project to examine the short-term effects and long-term sustainability of this QI initiative.

MATERIALS & METHODS

Approval for the study was obtained from our Quality Improvement Assessment Board. Our QI project utilized the Six Sigma Define, Measure, Analyze, Improve and Control (DMAIC) model to improve VTE prophylaxis rates. We assembled a multidisciplinary team that included physicians, nurses, and pharmacists. The reasons for poor VTE prophylaxis's utilization were identified using an Ishikawa diagram. Upon analysis we determined that the current process for risk assessment and orders for VTE prophylaxis in the medical population provided no decision support for providers. Other studies have suggested that using order sets combined with provider education have demonstrated improvement in VTE prophylaxis rates.^(15, 16) Therefore, a standardized VTE prophylaxis section was added to all electronic admission order sets in June 2011. The module included a linked risk assessment, where the provider specified whether the patient was considered low, moderate or high risk for VTE development based on the criteria shown in Table 1. For patients considered at moderate risk, mechanical as well as pharmacologic prophylaxis with LMWH or unfractionated heparin was ordered from the same orderset unless contraindicated. Contraindications are listed in Table 2. Patients with a BMI ≥ 50 kg/m² received 40 mg of enoxaparin every 12 hours. All patients also received mechanical prophylaxis with graduated compression stockings and sequential compression devices. Patients with no active cancer diagnosis and admission lasting less than 48 hours were considered to be at low risk for VTE and received mechanical prophylaxis alone.

The next step in our implementation phase consisted of providing these guidelines to all faculty, clinical pharmacists and midlevel providers. A faculty retreat was conducted to educate providers on the guidelines, literature, and resources available to support this effort. Consensus was obtained from all faculty members and midlevel providers to adhere to the guidelines. The guidelines were then communicated to the trainees, as well as the outpatient and inpatient nursing staff.

To evaluate the success of our QI initiative, our study population was composed of three historical cohorts consisting of all medical admissions to the gynecologic oncology service over three periods of 60 days each. Therefore, in each cohort, there were patients who were admitted to the hospital multiple times. Patients who were known to have surgery in the last 30 days were not considered in this study. Our pre-guideline implementation cohort consisted of 99 consecutive admissions (77 unique patients) between January 1 and February 28, 2011. Our post-guideline implementation cohort consisting of 127 consecutive admissions (101 unique patients) admitted between June 15 and August 15, 2011. These two groups were then compared to a sustainability cohort consisting of 109 admissions (90 unique patients) admitted between June 15 and August 15, 2013. Patients were excluded if they had a pre-existing VTE, were low risk, or had a documented contraindication to

pharmacologic prophylaxis. Outcome measures included: 1) number of admissions receiving VTE pharmacologic prophylaxis within 24 hours of admission; and 2) number of hospital-acquired VTEs diagnosed within 30 and 90 days of discharge.

Patient demographic and clinical data were abstracted from the electronic medical record. Institutional and pharmacy electronic databases were queried for date and time of admission, LOS, and drug utilization information. Diagnostic imaging reports and medical records were reviewed for the diagnosis of a VTE, defined as DVT or PE confirmed by imaging during hospitalization or within 90 days of discharge. All imaging studies were performed because of symptoms of VTE, as part of cancer evaluation, or for other non-related indications. Routine imaging was not performed solely for the purpose of detecting asymptomatic VTEs.

Demographic and clinical characteristics were summarized using descriptive characteristics. Categorical variables were expressed as frequencies, and continuous variables were expressed using mean, median, and range. Kruskal-Wallis and Fisher's exact tests were used to compare demographic and clinical factors as well as VTE rates between the three cohorts. All p-values are 2-sided and considered significant if <0.05 . All analyses were performed using Stata 13.0 for Macintosh statistical software (StataCorp, College Station, TX).

RESULTS

Among the pre-guideline implementation cohort, 51 of the 99 admissions were ineligible because of an existing VTE ($n=25$, 25.3%) or a documented contraindication ($n=26$, 26.3%), leaving 48 evaluable admissions (48.5%). Among the post-guideline implementation cohort, 51 of the 127 admissions were ineligible because of an existing VTE ($n=13$, 10.2%), low risk of VTE ($n=1$, 0.8%), or a documented contraindication ($n=37$, 29.1%), leaving 76 evaluable admissions (59.8%). Among the sustainability cohort, 38 of the 109 admissions were ineligible because of an existing VTE ($n=7$, 6.4%), low risk of VTE ($n=3$, 2.8%), or a documented contraindication ($n=28$, 25.7%), leaving 71 evaluable admissions (65.1%). The most common reason cited for contraindication to pharmacologic prophylaxis in all three cohorts was an anticipated interventional radiology procedure within 24 hours ($n=6$, 6.1%; $n=15$, 11.8%; $n=13$, 11.9%, $p=0.25$) (Table 2).

Demographic and clinical factors (Table 3) were compared between the three groups. There were no significant differences between the three groups in median age, BMI, or LOS. The distribution of disease type did vary between the three groups; the sustainability cohort had a higher prevalence of ovarian cancer ($p=0.02$). The reasons for admission are displayed in Table 3. The pre-guideline cohort was noted to have more admissions for infection compared to the post-guideline and sustainability cohorts: 17 (35.4%) v. 21 (27.6%) v. 7 (9.9%), respectively ($p=0.002$). Otherwise, there was no statistically significant difference in the reasons for admission.

In the pre-guideline cohort, only 10 of 48 admissions (20.8%) received pharmacologic prophylaxis within 24 hours of admission, compared with 67 of 76 admissions (88.2%) after guideline implementation, and 51 of 71 (71.8%) in the sustainability cohort ($p<0.001$) (Table 4). Yet despite the improvement in pharmacologic prophylaxis, there was no

statistically significant difference in hospital-acquired VTE incidence within 30 and 90 days of admission (Table 4). However, the prevalence of pre-existing VTEs declined over time with each cohort: 25/99 (25.3%) v. 13/127 (10.2%) v. 7/109 (6.4%), respectively ($p<0.001$).

In total, 11 unique patients of the 290 admissions without a pre-existing VTE (3.8%) developed a new VTE. Three of these 11 patients were excluded from our primary analysis secondary to a contraindication to pharmacologic prophylaxis (two had an interventional radiology procedure planned within 24 hours and one was receiving end-of-life care). Six of the eight evaluable patients who developed a VTE had received pharmacologic anticoagulation within 24 hours of admission. Both patients who did not receive adequate prophylaxis were in the pre-guideline implementation cohort. One of these patients had two prior admissions 3 weeks apart for inpatient chemotherapy; she did not receive pharmacologic prophylaxis during either admission. The second patient did receive prophylaxis, but not within 24 hours.

Table 5 compares characteristics between patients who developed a VTE and patients who did not. The number of patients without a VTE is derived from the total admissions ($n=335$), but excludes patients with a pre-existing VTE ($n=45$) and those who developed a VTE (the 11 unique patients with a VTE had 14 admissions across the three cohorts). There were no statistically significant differences between those who developed a VTE and those who did not with respect to age, BMI, LOS, and cancer type.

One patient in the pre-guideline implementation group, three patients in the post-guideline implementation group, and one patient in the sustainability group who developed a VTE within 90 days of hospitalization presented with symptoms of leg swelling or shortness of breath. The remaining patients were asymptomatic and were diagnosed with VTE on routine imaging for cancer surveillance with a computed tomography scan. The median time between admission and VTE diagnosis was 18 days (range 4-32) in the pre-guideline implementation group, compared with 8 days (range 5-29) in the post-guideline implementation group and 2 days in the sustainability group (range 2-67) ($p=0.76$). There were no VTE-related deaths in any of the three cohorts. There were no significant adverse events related to pharmacologic anticoagulants reported in any of the three cohorts.

Of the 40 patients who had a contraindication to anticoagulation because of an anticipated procedure within 24 hours of admission, 29 patients underwent a procedure. Of those 29 patients, 11 were restarted on anticoagulation within 24 hours following the procedure. Of the 18 who were not restarted on LMWH within 24 hours, 8 were considered fully ambulatory and discharged on POD#1, 2 were transitioned to supportive care measures only, one had a medical contraindication to pharmacologic anticoagulation, 2 received LMWH, but it was more than 24 hours after procedure and 5 were missed opportunities. Of the 11 patients who did not undergo a procedure within 24 hours, 4 were restarted on LMWH within 24 hours of the decision to forego the procedure. Of the 7 who were not restarted on anticoagulation, 3 were considered fully ambulatory and discharged on POD#1, 2 were transitioned to supportive care measures only and 2 were missed opportunities.

DISCUSSION

VTE is the leading potentially preventable cause of hospital-associated mortality.⁽¹⁾ Despite clear clinical recommendations, adherence to pharmacologic VTE prophylaxis is inconsistent. There are multiple reasons to explain this under-utilization including: lack of physician familiarity or agreement, underestimation of the VTE risk, concern over the risk of bleeding, and the perception that translating guidelines into practice is resource intensive and difficult to implement.⁽¹⁷⁾ Pharmacologic prophylaxis is considered safe and cost-effective, and improving compliance with VTE prophylaxis and decreasing preventable hospital-acquired VTE has become a national priority. By utilizing several QI tools such as a team-based approach, provider education and standardization of order sets, our QI project improved pharmacologic VTE prophylaxis rates from 20.8% to 88.2% among gynecologic oncology patients admitted for nonsurgical indications. However, after 2 years, our rates declined to 71.8%. Furthermore, despite increased adherence to guidelines, hospital-acquired VTE rates did not decline (4.2% vs. 3.9% v. 4.2%, respectively, $p=1.00$). These data suggest that existing international guidelines may be inadequate for this high-risk population.

Similar to previous reports, our study shows a high incidence of VTE despite improved compliance with VTE prophylaxis guidelines. A study by Lecumberri *et al.*⁽³⁾ revealed that 7 of 11 (63.6%) oncologic patients developed a VTE despite appropriate prophylaxis. Although implementation of e-alerts for VTE prophylaxis decreased VTE rates among patients without malignancy, improved adherence to guidelines did not decrease VTE rates among those with active cancer (3.8/1000 before e-alerts v. 3.3/1,000 with e-alerts, $p=.90$). Kucher *et al.*⁽¹⁸⁾ also revealed that 60% of oncologic patients developed a VTE despite receiving either pharmacologic (49%) or mechanical prophylaxis (21%). Their study population consisted of all patients admitted to 14 acute care hospitals in Switzerland and included both medical and surgical admissions. The authors only included cancer patients with VTE within 30 days of hospitalization, thus likely underestimating the incidence in comparison to other studies that have followed patients for 90 days.

A 2013 Cochrane Review⁽¹⁹⁾ covered 55 studies involving interventions for implementation of prophylaxis in hospitalized medical and surgical patients. Although this meta-analysis revealed improvements in guideline adherence with education, alerts, and multifaceted interventions, the seven nonrandomized trials that reported VTE rates revealed no difference between the control and intervention groups with regard to VTE incidence. In the three nonrandomized studies of alerts, 53 of 8943 patients in the control group and 47 of 8860 patients in the intervention group presented with VTE (RR 0.85, 95% CI 0.49 to 1.46). Likewise, in the four nonrandomized studies of multifaceted interventions, there were no differences in VTE rates. A total of 147 of 11,070 patients in the control group and 117 of 12,921 patients in the intervention group presented with VTE (RR 1.01, 95% CI 0.51 to 1.98).

Per ASCO^(8, 9), ACCP⁽⁷⁾, NCCN⁽¹⁰⁾, and ESMO⁽¹¹⁾ guidelines, routine VTE prophylaxis with anticoagulation is not recommended for ambulatory gynecologic patients with cancer.⁽²⁰⁾ However, despite decreased VTE rates seen in clinical trials with pharmacologic

prophylaxis, several aforementioned studies, including ours, have failed to show the same decline in suspected preventable VTEs in nontrial settings. In June 2013, ASCO updated the VTE clinical practice guidelines to include a risk assessment for ambulatory patients undergoing chemotherapy. ASCO now recommends that oncology patients be assessed for VTE risk at the time of chemotherapy initiation and periodically thereafter using a predictive risk assessment model adapted from the Khorana scoring system.⁽⁸⁾ Routine prophylaxis is still not currently recommended; however, assessment and discussion of risk are strongly encouraged.

The present study is limited by several factors. First, a large percentage of admissions were ineligible due to contraindication to pharmacologic prophylaxis or pre-existing VTE. To account for this, we followed all patients for an additional 90 days and included those who developed VTE in our analysis. Second, this is a single-institution study from a large cancer center and may lack external validity. Third, follow-up was not standardized across cohorts, potentially resulting in surveillance bias. We did not provide specific guidance for VTE assessment, and therefore all VTEs were detected based on clinical suspicion or as an incidental finding on routine imaging. Fourth, our patient population represents a large geographic area, and patients may seek emergency services closer to home, potentially resulting in VTE detection bias. As a result of both the surveillance and detection bias, our reported VTE incidence is likely an underrepresentation of the true VTE incidence in this population. Fifth, our institution lacks a true electronic medical record with interactive decision support. This decision support includes e-alerts and human alerts. Use of these has been shown to reinforce and optimize education and guideline adherence.⁽¹⁷⁾ Therefore, although the risk assessment and the order for anticoagulation are within the same orderset, in our electronic ordering system neither are mandatory fields and thus subject to human error. And last, we considered VTE prophylaxis to have been given based on the time of the first dose of the anticoagulation agent; however, we did not track what percentage of patients had interruptions to their course of anticoagulation during the hospitalization. Therefore, it is possible that patients who were initiated on therapy may not have completed an appropriate course during their entire hospitalization.

Despite these limitations, to our knowledge, this is the first VTE QI initiative in medical gynecologic oncology patients. We showed that improved adherence to practice guidelines for VTE prophylaxis in hospitalized patients is feasible by utilization of a multidisciplinary team approach with implementation of standardized departmental guidelines, provider education, and the use of standardized order sets. Although we anticipated that practice improvement initiatives would result in fewer VTE events, unexpectedly, our data revealed that in fact improved adherence to guidelines did not reduce the number of adverse events. Interestingly, the prevalence of pre-existing VTEs declined over time with each cohort, but the incidence of VTE did not change. However, our study was likely underpowered to detect a difference in VTE incidence. Considering that other population-based studies have not shown a decrease in VTE prevalence, this may have been due to our improved compliance with extended LMWH prophylaxis in our surgical patients⁽¹⁵⁾ or selection bias, as this was a non-randomized trial.⁽¹⁹⁾

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TABLE 1**VTE Risk Assessment**

Low Risk	Moderate Risk	High Risk
<ul style="list-style-type: none"> • Minor surgery with expected LOS less than 24 hours • Fully ambulatory with no active cancer diagnosis and expected LOS than 48 hours 	<ul style="list-style-type: none"> • Patients with one or more risk factors (active cancer, active hormonal treatment or chemotherapy, age greater than 60, BMI 30 or greater, central venous catheter, prior history of VTE or CHF) 	<ul style="list-style-type: none"> • Abdominal or pelvic surgery for cancer • Major surgery with one or more risk factors (active cancer, active hormonal treatment or chemotherapy, age greater than 60, BMI 30 or greater, central venous catheter, prior history of VTE or CHF)

Abbreviations: LOS, length of stay; BMI, body mass index; VTE, venous thromboembolism; CHF, congestive heart failure.

TABLE 2

Comparison of indications for holding pharmacologic prophylaxis between cohorts

	Pre-guideline implementation Cohort (n=99)	Post-guideline implementation Cohort (n=127)	Sustainability Cohort (n=109)	p-value ^a
Documented contraindication				
Thrombocytopenia (platelets <50,000/mm ³)	0 (0%)	2 (1.6%)	3 (2.8%)	0.33
On anticoagulants at admission	1 (1.0%)	2 (1.6%)	2 (1.8%)	1.00
Anticipated IR procedure within 24 hours	6 (6.1%)	15 (11.8%)	13 (11.9%)	0.25
Recent CNS bleed	2 (2.0%)	1 (.8%)	0 (0%)	0.39
Recent GI bleed	1 (1.0%)	3 (8.1%)	1 (0.9%)	0.63
Intracranial or spinal lesion at high risk of bleed	5 (5.1%)	0 (0%)	0 (0%)	0.002
End of life care	1 (1.0%)	2 (2.4%)	0 (0%)	0.64
Active bleeding	3 (3.0%)	6 (4.7%)	8 (7.3%)	0.36
Anticipated surgery within 24 hours	2 (2.0%)	4 (3.1%)	0 (0%)	0.17
Anemia	5 (5.1%)	2 (1.6%)	1 (0.9%)	0.18
Pre-existing VTE				
	25 (25.3%)	13 (10.2%)	7 (6.4%)	<0.001
Low Risk				
	0 (0%)	1 (.8%)	3 (2.8%)	0.20

Abbreviations: IR, interventional radiology; CNS, central nervous system; GI, gastrointestinal, VTE, venous thromboembolism.

^a p-values were determined using a 2-sided Fisher's exact test.

TABLE 3

Clinical and demographic factors

Factor	Pre-guideline implementation Cohort (n=48)	Post-guideline implementation Cohort (n=76)	Sustainability Cohort (n=71)	p-value ^a
Age (years)				
Mean (SD)	52.6 (15.6)	54.3 (13.7)	56.6 (16.0)	0.21
Median (range)	48.5 (30 – 83)	56.0 (26 – 87)	60 (21 – 85)	
BMI (kg/m ²)				
Mean (SD)	31.0 (10.8)	28.3 (8.1)	27.0 (7.5)	0.21
Median (range)	27.2 (18.9 – 61.3)	25.8 (18.2 – 49.6)	25.3 (13.5 – 50.1)	
Cancer type (n (%))				
Ovary	20 (41.7%)	31 (40.8%)	44 (62.0%)	0.02
Uterus	13 (27.1%)	23 (30.3%)	15 (21.1%)	0.47
Cervix	11 (22.9%)	14 (18.4%)	10 (14.1%)	0.44
Vagina/vulva	2 (4.1%)	6 (7.9%)	1 (1.4%)	0.19
Other	2 (4.2%)	2 (2.6%)	1 (1.4%)	0.74
Length of stay (days)				
Mean (SD)	4.6 (3.0)	7.3 (6.7)	7.0 (7.7)	0.33
Median (range)	4 (1 – 14)	5 (1 – 31)	4 (1 – 39)	
Reason for admission ^b				
Pain	13 (27.1%)	12 (15.8%)	17 (23.9%)	0.26
Infection	17 (35.4%)	21 (27.6%)	7 (9.9%)	0.002
Nausea/vomiting/SBO	12 (25.0%)	21 (27.6%)	21 (29.6%)	0.88
Cardiac	0 (0%)	4 (5.3%)	4 (5.6%)	0.25
Renal	2 (4.2%)	8 (10.5%)	3 (4.2%)	0.29
Neurologic	1 (2.1%)	1 (1.3%)	2 (2.8%)	0.83
Pulmonary	5 (10.4%)	2 (2.6%)	4 (5.6%)	0.19
Chemotherapy	7 (14.6%)	12 (15.8%)	14 (19.7%)	0.78
Bleeding	1 (2.1%)	1 (1.3%)	1 (1.4%)	1.00
Hematologic	0 (0%)	0 (0%)	1 (1.4%)	0.61
Failure to thrive	0 (0%)	2 (2.6%)	1 (1.4%)	0.79

Abbreviations: SD, standard deviation; SBO, small bowel obstruction

^a p-values were determined using a two-sided Fisher's exact test for categorical variables or Kruskal-Wallis test for continuous variables.

^b Some patients had more than one reason for admission.

TABLE 4

Comparison of pharmacologic prophylaxis and VTE rates between cohorts

	Pre-guideline implementation Cohort (n=48)	Post-guideline implementation Cohort (n=76)	Sustainability Cohort (n=71)	p-value^a
Pharmacologic prophylaxis within 24 hours of admission	10 (20.8%)	67 (88.2%)	51 (71.8%)	<0.001
VTE within 30 days of hospitalization	1 (2.1%)	3 (3.9%)	2 (2.8%)	1.00
VTE within 90 days of hospitalization	2 (4.2%)	3 (3.9%)	3 (4.2%)	1.00
Time from admission to VTE				
Mean	18.0	14.0	23.7	0.76
Median (range)	18.0 (4 – 32)	8.0 (5 – 29)	2 (2 – 67)	
VTE type (n=8 (4.8%))				
PE	0 (0%)	2 (2.6%)	2 (2.8%)	0.68
DVT	1 (2.1%)	0 (0%)	1 (1.4%)	0.52
PE and DVT	1 (2.1%)	1 (1.3%)	0 (0%)	0.71
VTE presentation (n=8 (4.8%))				
Symptomatic	1 (2.1%)	3 (3.9%)	1 (1.4%)	0.85
Incidental finding	1 (2.1%)	0 (0%)	2 (2.8%)	0.35

Abbreviations: VTE, venous thromboembolism; PE, pulmonary embolus; DVT, deep-vein thrombosis.

^a p-values were determined using a two-sided Fisher exact test or Kruskal-Wallis test.

TABLE 5

Comparison of characteristics between admissions for patients who developed a VTE and patients who did not develop a VTE

Characteristic	No VTE (n=276)	VTE (n=14 ^a)	p-value ^b
Age (years)			
Mean (SD)	55.9 (14.7)	53.8 (17.3)	0.51
Median (range)	58 (21 – 90)	57 (27 – 85)	
BMI (kg/m ²)			
Mean (SD)	28.7 (9.1)	31.3 (8.1)	0.13
Median (range)	26.3 (13.5 – 64.5)	28.4 (22.1 – 46.4)	
Length of stay (days)			
Mean (SD)	6.1 (6.0)	9.5 (8.6)	0.06
Median (range)	4 (1 – 39)	6.5 (1 – 30)	
Cancer type (n (%))			
Ovary	129 (46.7%)	7 (50.0%)	1.00
Uterus	73 (26.4%)	4 (28.6%)	1.00
Cervix	56 (20.3%)	1 (7.1%)	0.48
Vagina/vulva	13 (4.7%)	0 (0%)	1.00
Other	5 (1.8%)	2 (14.3%)	1.00
Received adequate prophylaxis within 24 hours	122 (44.2%)	7 (50.0%)	0.79
Most common reason for admission	Infection 66 (23.9%)	Nausea/vomiting/SBO 5 (35.7%)	
Patients with more than one admission in 2 months	55 (19.9%)	3 (21.4%)	1.00

Abbreviations: SD, standard deviation; VTE, venous thromboembolism; SBO, small bowel obstruction

^a The 11 patients with VTE had a total 14 admissions over the three time periods.

^b p-values were determined using a two-sided Fisher exact test, two-sided *t*-test, or Kruskal-Wallis test.