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ORIGINAL RESEARCH

The Collateral Benefit of COVID Pandemic: Improved Pharmacological Venous Thromboembolism Prophylaxis Practices in Non-COVID Patients

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Background: COVID-19 creates a hypercoagulable state with a wide spectrum of clinical manifestations. Of those, venous thromboembolism (VTE) is prevalent, and numerous studies have highlighted the importance of VTE prophylaxis. Pre-pandemic VTE prophylaxis practices have already been poor, despite guidelines. We hypothesized that the gap between guidelines and practices might have been closed due to increased awareness.

Materials and Methods: Non-COVID-19 patients hospitalized in the internal medicine ward of a university hospital between January 1st, 2021, and June 30th, 2021, were assessed. VTE risk and thromboprophylaxis requirements were assessed using the Padua Prediction Score (PPS). The results were compared with the findings of the study conducted in the same setting before the pandemic.

Results: A total of 267 patients were included, and 81 patients (30.3%) received prophylaxis. A total of 128 patients' (47.9%) PPS was ≥ 4, and 69 patients (53.9%) received prophylaxis; 12 low-risk patients (8.6%) received prophylaxis although it was not indicated. Compared to the pre-pandemic figures, both appropriate prophylaxis use and overuse rates have risen. While the increment rate of appropriate prophylaxis was statistically significant, the increment rate of overuse did not reach statistical significance. Patients hospitalized for infectious diseases and respiratory failure were more likely to receive appropriate prophylaxis.

Conclusion: We have demonstrated a significant increase in appropriate pharmacologic prophylaxis rates among high-risk patients. Besides all the collateral damage the pandemic has created, it might also have brought collateral benefits with regards to VTE prophylaxis.

Keywords: COVID-19, venous thromboembolism, risk assessment, quality of health care, quality improvement

Introduction

Venous thromboembolism (VTE), a frequent complication among hospitalized patients, is considered as one of the most common preventable causes of inpatient mortality.[1,2] Through accumulated knowledge, the United States (US) Joint Commission and many national regulations have endorsed standardized protocols and risk assessment tools to utilize appropriate prophylactic practices.[3–5] These efforts have resulted in variable degrees of improvement in some hospitals, particularly in the accredited hospitals; however, data from the literature still show a non-negligible gap between evidence and practice in VTE prophylaxis.[6–9]

In our previous 2019 study, we demonstrated the inadequate pharmacological VTE prophylaxis rates among high-risk hospitalized patients in the internal medicine wards and delineated an inpatient population at risk for not receiving appropriate prophylaxis.[10] As the results pointed out a clinical practice area where there is a lot of room for

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improvement, the quality team planned to start a plan-do-check-act cycle (PDCA) with the objective of improving VTE prophylaxis practices in the medical wards. However, as the COVID-19 pandemic hit the world and the healthcare system,[11] the hospital's organizational structure changed. Capacity reduction for non-COVID-19 internal medicine patients to create space for COVID-19 patients as well as reorganization of outpatient clinics to serve COVID-19 patients are a few examples. These extraordinary events had shifted the quality team's focus from VTE prophylaxis quality improvement to COVID-19-related issues, thus the desired PDCA cycle could not have been commenced.

COVID-19 is a hypercoagulable state where VTE is very common in acutely ill patients.[12,13] Despite the appropriate prophylaxis, VTE events were seen in up to one-third of patients at the beginning of the pandemic. Frequent VTE events had increased the awareness of the physicians with regards to appropriate VTE prophylaxis practices. Compared with the early pandemic times, this increased awareness and appropriate prophylaxis use resulted in decreased VTE events.[14–16]

The COVID-19 pandemic has evoked untoward issues that are not directly related to the disease itself but rather the unparalleled environment it has created. Skipped follow-up visits for chronic disease management, postponed emergent or urgent interventions for potentially lethal and acute disorders, and lower adherence to routine screening programs were the most pronounced consequences encountered during the pandemic.[17–20] All those consequences or associated conditions have been nominated as "collateral damage".[18] However, we have proposed that the increased awareness of VTE prophylaxis practices might have also increased appropriate VTE prophylaxis practices for the non-COVID-19 internal medicine patients.

This study aimed to investigate whether the COVID-19 pandemic-related increase in VTE prophylaxis awareness also increased the appropriateness of VTE prophylaxis practices among the non-COVID-19 patients who were hospitalized in internal medicine wards.

Materials and Methods

This cross-sectional, single-center study was conducted in a cohort of non-COVID-19 patients hospitalized in a tertiary-care university hospital in Ankara, Turkey. Clinical and demographic data were acquired from electronic medical records (EMR). All patients aged ≥ 18 years who were admitted to the general internal medicine wards between January 1st, 2021, and June 30th, 2021, were evaluated for enrollment (Figure 1). Our previously conducted study's population consisted of patients hospitalized in general internal medicine wards between January 1st and June 30th, 2019, thus we screened the patients hospitalized during a similar time period in order to achieve similar patient characteristics. The following patients were excluded: those with inadequate EMR, patients under 18 years old, and patients hospitalized for less than 24 hours. Of the remaining patients, further exclusion criteria were applied to exclude patients not suitable for the scope of this study and patients for whom VTE prophylaxis practices were not developed. These criteria included patients who were hospitalized for planned interventions, anticoagulated prior to admission (currently taking anticoagulation for any reason), diagnosed with COVID-19 after admission, transferred from or to surgical wards, who had confirmed or suspected hemorrhage, a diagnosis of cirrhosis (Child-Pugh B and C), overt thrombocytopenia (platelet count <50,000/mm3), an etiological investigation of thrombocytopenia (platelet count <150,000/mm3), bone marrow transplantation, and pregnancy. Data regarding the anticoagulation regimens were obtained from the EMR. Patients who had received a subcutaneous unfractionated heparin dose of 10.000 to 15.000 IU per day or an enoxaparin dose of 40 mg for non-obese patients and 60 mg for obese patients per day were accepted as receiving pharmacological VTE prophylaxis. Inappropriately low doses (unfractionated heparin < 10.000 IU per day or lower adjusted enoxaparin dose) were not accepted as VTE prophylaxis.

Clinical Data

The following data were acquired using EMR for each patient: age, sex, components of the Padua Prediction Score (Table 1), comorbidities, reason for hospitalization, prior intensive care unit (ICU) admission, use of glucocorticoids and antiplatelet drugs, the choice of pharmacological VTE prophylaxis and doses, as well as appropriateness. The Padua Prediction Score (PPS) was used to determine appropriateness: patients with a score of 4 were classified as "high-risk" for VTE events, while the remaining cases were classified as "low-risk". Use of anticoagulation in the high-risk group of patients and avoidance of anticoagulation in the low-risk group was accepted as "appropriateness". Patients who did not

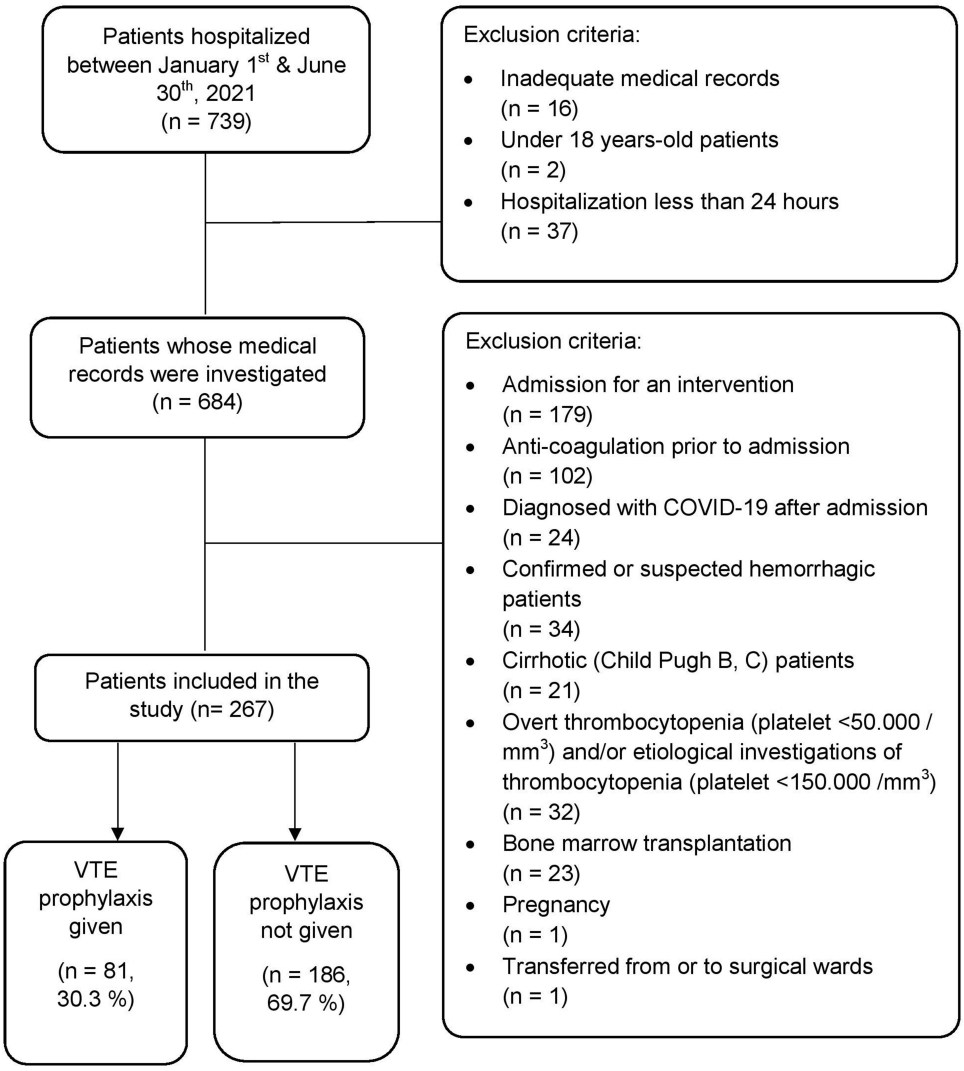

Figure 1 Flow diagram of the patients included and excluded.

receive VTE prophylaxis despite being high-risk were deemed to have "underuse", and patients who received VTE prophylaxis despite being low-risk were deemed to have "overuse". Both overuse and underuse were accepted as "inappropriateness."

Statistical Analysis

Continuous variables were given as the median ± interquartile range, as many variables were not distributed normally. Categorical variables were summarized as counts and percentages. The chi-squared test (χ^2 test) or Fisher's exact test was used for categorical variables and the Mann–Whitney *U*-test for continuous variables. A bar graph was used to visualize the extent of changes in prophylaxis rates in risk groups.

All analyses were conducted using IBM SPSS Software version 22.0 (SPSS Inc., Chicago, IL), licensed to the institution where the study was carried out. Two-sided significance testing was performed, and p-values less than 0.05 were considered significant.

Ethics

Each patient in our study was assigned an anonymous identification number to protect confidentiality, and the data were kept in electronic media as encrypted files on a single protected computer in the institution. Therefore, processing of this data does

Table 1 Patient Characteristics, Co-Morbidities, Reason for Hospitalization, Prior ICU Admission, Medications, Inappropriateness and Padua Prediction Score Variables

	Study Population (N= 267)	Patients Who Received VTE Prophylaxis (N= 81)	Patients Who Did Not Receive VTE Prophylaxis (N= 186)	*p* value*
Patient Characteristics				
Age (median, IQR)	55 (33)	62 (27)	50 (35)	**0.001**
Sex (female)	132 (49.4)	42 (31.8)	90 (68.2)	0.6
Co-morbidities				
Systemic hypertension	122 (45.7)	41 (33.6)	81 (66.4)	0.28
Diabetes mellitus	85 (31.8)	30 (35.3)	55 (64.7)	0.25
Chronic kidney disease	69 (25.8)	20 (29)	49 (71)	0.77
Cardiac diseases[a]	50 (18.6)	22 (44)	28 (56)	**0.019**
Cirrhosis (Child-Pugh A)	3 (1.1)	1 (33.3)	2 (66.7)	NA
Malignancy	60 (22.5)	21 (35)	39 (65)	0.42
Respiratory diseases[b]	39 (14.9)	17 (43.6)	22 (56.4)	**0.05**
Connective tissue disorders	37 (13.9)	9 (24.3)	28 (75.7)	0.4
Chronic viral infections[c]	16 (6.0)	3 (18.8)	13 (81.3)	0.3
Other co-morbidities[d]	77 (28.8)	24 (31.2)	53 (68.8)	0.83
No co-morbidity	19 (7.1)	4 (21.1)	15 (78.9)	0.36
More than one co-morbidity	168 (62.9)	60 (35.7)	108 (64.3)	**0.013**
Reason for Hospitalization				
Infectious diseases	90 (33.7)	36 (40)	54 (60)	**0.014**
Acute respiratory failure	38 (14.2)	25 (65.8)	13 (34.2)	**<0.001**
Rheumatological disease flare	12 (4.5)	1 (8.3)	11 (91.7)	0.09
Acute heart failure	10 (3.7)	7 (70)	3 (30)	**0.005**
Acute kidney injury	42 (15.7)	12 (28.6)	30 (71.4)	0.72
Uncontrolled hyperglycaemia	25 (9.4)	5 (20)	20 (80)	0.24
Aetiological investigations FOR an inflammatory disease or malignancy[e]	42 (15.7)	17 (40.5)	25 (59.5)	0.119
Aetiological investigations FOR non-inflammatory diseases[f]	35 (13.2)	6 (17.1)	29 (82.9)	0.07
Chemotherapy and/or radiotherapy	16 (6)	2 (12.5)	14 (87.5)	0.11
Other causes[g]	41 (15.4)	12 (29.3)	29 (70.7)	0.32
More than one reason	66 (24.7)	33 (50)	33 (50)	**<0.001**
Prior ICU admission	21 (7.8)	17 (81)	4 (19)	**<0.001**

(*Continued*)

Table 1 (Continued).

	Study Population (N= 267)	Patients Who Received VTE Prophylaxis (N= 81)	Patients Who Did Not Receive VTE Prophylaxis (N= 186)	*p* value*
Medications				
Ongoing anti-platelet treatment	54 (20.2)	18 (33.3)	36 (66.7)	0.6
Glucocorticoids	59 (22.1)	19 (32.2)	40 (67.8)	0.72
Inappropriateness	71 (26.5)	12 (16.9)	59 (83.1)	**0.004**
Padua Prediction Score Variables				
Active cancer	47 (17.6)	19 (40.4)	29 (59.6)	0.1
Previous venous thromboembolism	0 (0)	NA	NA	NA
Bed rest ≥ 3 days	125 (46.8)	68 (54.4)	57 (45.6)	**<0.001**
Thrombophilia	1 (0.4)	0 (0)	1 (100)	NA
Recent trauma/surgery	3 (1.1)	0 (0)	3 (100)	0.252
Obesity	52 (19.4)	15 (28.8)	37 (71.2)	0.81
Acute infection and/or rheumatologic disorder	113 (42.3)	43 (38.1)	70 (61.9)	**0.019**
Age ≥70 years	62 (23.1)	25 (40.3)	37 (59.7)	**0.048**
Heart/Respiratory failure	47 (17.6)	30 (63.8)	17 (36.2)	**<0.001**
Ongoing hormonal treatment[h]	0	NA	NA	NA
Padua Prediction Score ≥ 4	128 (47.9)	69 (53.9)	59 (46.1)	**<0.001**
Median Padua Prediction Score (median, IQR)	3 (4)	5 (2)	1 (4)	**<0.001**

Notes: *p values ≤ 0.05 are shown in bold. [a]"Cardiac diseases" includes dysrhythmia, heart failure and/or ischemic heart disease. [b]"Respiratory diseases" includes obstructive airway and/or restrictive parenchymal diseases. [c]"Chronic viral infections" include chronic hepatitis B, C and HIV infections. [d]"Other co-morbidities" consist of a very heterogeneous group; however, one must have debilitating and/or chronic condition to be classified under this sub-group. [e]His group consists of probable inflammatory conditions in patients with unexplained weight loss, fever or other non-specific symptoms suggesting an underlying of inflammatory disease or malignancy. [f]This group consists of non-inflammatory conditions in patients with unexplained hormonal disturbances or kidney dysfunction. [g]"Other causes" consist of a heterogeneous group which includes malnutrition, electrolyte disturbances etc., however with no evidence of organ failure or critical disease. [h]For women only, indicates oral contraceptives or hormone replacement therapy.
Abbreviations: IQR, interquartile range; ICU, intensive care unit; VTE, Venous thromboembolism; NA, not applicable.

not require informed consent, and written informed consent was not obtained due to the study's retrospective nature. The study complies with the principles outlined in the Declaration of Helsinki, and the study was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee (date: June 29, 2021, Decision No: GO 21/864).

Results

739 patients were hospitalized in the non-COVID-19 internal medicine wards for the given period. After excluding patients who had inadequate or conflicting clinical data (n = 16), patients hospitalized for less than 24 hours (n = 37), and patients younger than 18 years old (n = 2), the EMR of 685 patients was further evaluated. A total of 417 patients were excluded due to exclusion criteria, and 268 patients were found to be eligible for inclusion (Figure 1).

Patient Characteristics

132 patients were female (49.4%), and the median age was 55 years (IQR, 35). The most common comorbidities were hypertension (n = 122, 45.7%) and diabetes mellitus (DM) (n = 85, 31.8%). Patients had a high chronic disease burden,

with 168 (62.9%) patients having two or more comorbidities. The most common reason for hospitalization was infections requiring intravenous antibiotics (n = 90, 33.7%). 66 patients (24.7%) had more than one reason for admission. 54 patients (20.2%) were under antiplatelet treatment, and 59 patients (22.1%) were receiving glucocorticoids. A considerable proportion of the cohort had a history of bed rest for three days or more (n = 125; 46.8%) and an acute infection or rheumatologic disorder (n = 113; 42.3%).

81 patients (30.3%) had received pharmacologic VTE prophylaxis. VTE prophylaxis rate differences were not statistically significant across sexes but were statistically significant between patients over and under 70 years old. A higher proportion of patients who received VTE prophylaxis were older than 70 years old. Regarding patient comorbidities, patients who received VTE prophylaxis had statistically significantly higher rates of cardiac diseases and had more than one comorbidity. Regarding reasons for hospitalization, patients hospitalized due to infectious diseases, acute respiratory failure, or acute heart failure, and patients who had more than one reason for hospitalization, showed statistically significant higher rates for receiving VTE prophylaxis. The highest rate of pharmacological prophylaxis was observed among patients who were transferred from the ICU (81%). The median PPS of the study cohort was 3 (IQR = 4), the median PPS of patients who received VTE prophylaxis was 5 (IQR = 2), and the median PPS of patients who did not receive VTE prophylaxis was 1 (IQR = 4). The PPS of patients who received VTE prophylaxis was statistically significantly higher than that of those who did not.

Assessments of the Appropriateness of VTE Prophylaxis

128 patients (47.9%) had PPS ≥ 4 (high risk) that required VTE prophylaxis, yet 69 patients (54%) received VTE prophylaxis. 59 patients (46%) were also deemed high-risk according to the PPS but did not achieve VTE prophylaxis (underuse). 139 patients (52%) had PPS < 4 (low risk) and did not require VTE prophylaxis, but 127 patients (91.3%) did not receive VTE prophylaxis appropriately, while 12 patients (8.6%) received VTE prophylaxis (overuse). Table 2 summarizes the use of VTE prophylaxis with respect to PPS. Overuse rates did not differ across different patient characteristics, comorbidities, reasons for hospitalization, and medications. Underuse was not different across age, sex, comorbidities, or number of comorbidities; however, it was significantly lower in patients who were hospitalized due to etiological investigations of inflammatory disease or malignancy (22.7%; p = 0.02) and significantly higher in patients hospitalized for treatment with chemotherapy or radiotherapy (81.8%; p = 0.015). Table 3 summarizes the main characteristics of low- and high-risk patients who received VTE prophylaxis without indication (overuse) or did not receive it despite indication (underuse).

Improvement of VTE Prophylaxis Practices

To compare the current VTE prophylaxis practices with the pre-pandemic practices and assess whether COVID-19-related increased VTE prophylaxis awareness has led to improved VTE prophylaxis practices, we used the data acquired in our previous study, in which the same setting and the same methodology were used. In terms of comorbidities, median age, and reasons for hospitalization, both groups had similar clinical and demographic traits.

In the previous cohort, a total of 295 patients had been included, and 89 patients (30.2%) had been deemed high-risk according to PPS. Thirty-three patients (30.3%) had received VTE prophylaxis, and 69.7% were underusers. In the

Table 2 VTE Prophylaxis Use with Respect to Thromboembolism Risk Assessed with PPS

	PPS ≥ 4 (High Risk)	**PPS < 4 (Low Risk)**
Patient number	128	139
VTE prophylaxis		
- Present	69	12
- Absent	59	127

Abbreviations: PPS, Padua Prediction Score; VTE, Venous Thromboembolism.

Table 3 Clinical Characteristic of Patients Who Did Not Receive VTE Prophylaxis Despite Indication and Received VTE Prophylaxis without Indication

	Patients Who Did Not Receive VTE Prophylaxis Despite Indication (n = 59/128)			Patients Who Received VTE Prophylaxis without Indication (n = 12/139)			Inappropriate VTE Prophylaxis (n = 71/267)		
	N	**%**	***p* value**	**N**	**%**	***p* value**	**N**	**%**	***P* value**
Patient Characteristics									
Female Sex	26	42.6	0.45	7	9.9	0.6	33	25	0.58
Age, years ≥70	25	50	0.48	0	0	NA	25	41	0.004
Co-morbidities									
Systemic hypertension	32	46.4	0.9	4	7.5	0.72	36	29.5	0.306
Diabetes mellitus	23	48.9	0.62	6	15.8	0.09	29	34.1	0.057
Chronic kidney disease	15	46.9	0.91	3	8.1	NA	18	26.1	0.9
Cardiac diseases[a]	14	40.0	0.43	1	6.7	NA	15	30	0.55
Malignancy	24	54.5	0.16	1	6.3	NA	25	41.7	0.004
Respiratory diseases[b]	9	36	0.26	1	7.1	NA	10	25.6	0.88
Connective tissue disorders	4	36.4	0.51	2	7.7	NA	6	16.2	0.12
Chronic viral infections[c]	5	71.4	0.24	1	11.1	0.57	6	37.5	0.38
Other co-morbidities[d]	15	44.1	0.78	5	11.6	0.51	20	26	0.89
Number of Co-morbidities									
0	2	33.3	0.75	0	0	0.4	2	10.5	0.07
1	13	50		4	7.4		17	21.3	
≥2	44	45.4		8	11.1		52	31	
Reason for Hospitalizations									
Infectious diseases	29	48.3	0.58	5	16.7	0.13	34	37.8	0.003
Acute respiratory failure	13	35.1	0.13	1	100	NA	14	36.8	0.12
Rheumatological disease flare	1	NA	NA	0	0	NA	1	8.3	0.14

(*Continued*)

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Table 3 (Continued).

	Patients Who Did Not Receive VTE Prophylaxis Despite Indication (n = 59/128)			Patients Who Received VTE Prophylaxis without Indication (n = 12/139)			Inappropriate VTE Prophylaxis (n = 71/267)		
	N	**%**	***p* value**	**N**	**%**	***p* value**	**N**	**%**	***P* value**
Acute heart failure	3	30	0.34	0	0	NA	3	30	0.8
Acute kidney injury	11	52.4	0.66	2	9.5	NA	13	31	0.48
Uncontrolled hyperglycaemia	5	55.6	0.73	1	6.3	NA	6	24.0	0.76
Aetiological investigations of inflammatory disease or malignancy[e]	5	22.7	0.02	0	0	NA	5	11.9	0.02
Aetiological investigations of non-inflammatory diseases[f]	1	33.3	0.64	4	21.1	0.06	5	14.3	0.07
Chemotherapy and/or radiotherapy	9	81.8	0.01	0	0	NA	9	56.3	0.015
Other causes[g]	9	45	0.9	1	4.8	0.7	10	24.4	0.72
Medications									
Antiplatelet therapy	17	51.5	0.47	2	9.5	NA	19	35.2	0.11
Corticosteroids	10	40	0.5	4	11.8	0.5	14	23.7	0.57
Padua Prediction Score									
Active cancer	21	53.8	0.24	1	12.5	0.524	22	45.8	0.001
Bedrest for ≥3 days	52	44.1	0.11	2	28.6	0.113	54	43.2	<0.001
Recent trauma/surgery	3	100	0.09	0	0	NA	3	100	0.02
Heart/respiratory failure	17	36.2	0.09	0	0	NA	17	36.2	0.1
Acute inflammation	30	44.1	0.7	5	11.1	0.525	35	31	0.16
Obesity	12	46.2	0.9	1	3.8	0.464	13	25.0	0.77

Notes: [a]"Cardiac diseases" includes dysrhythmia, heart failure and/or ischemic heart disease. [b]"Respiratory diseases" includes obstructive airway and/or restrictive parenchymal diseases. [c]"Chronic viral infections" include chronic hepatitis B, C and HIV infections. [d]"Other co-morbidities" consist of a very heterogeneous group; however, one must have debilitating and/or chronic condition to be classified under this sub-group. [e]This group consists of probable inflammatory conditions in patients with unexplained weight loss, fever or other non-specific symptoms suggesting an underlying of inflammatory disease or malignancy. [f]This group consists of non-inflammatory conditions in patients with unexplained hormonal disturbances or kidney dysfunction. [g]"Other causes" consist of a heterogeneous group which includes malnutrition, electrolyte disturbances etc., however with no evidence of organ failure or critical disease.
Abbreviations: VTE, Venous thromboembolism; NA, not applicable.

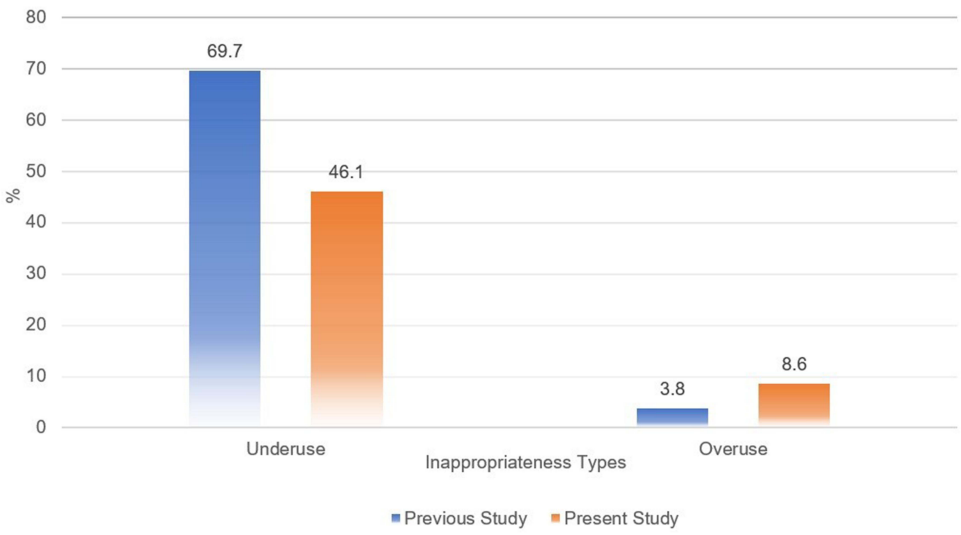

Figure 2 Comparison of prophylaxis inappropriateness before and during the pandemic.

present cohort, 69 of the 128 high-risk patients received VTE prophylaxis appropriately (53.9%) and the rate of underusers was 46.1%. The decrease in underuse was tested with χ^2 test and found to be statistically significant (p = 0.001, Figure 2). On the other hand, while the 3.8% rate of overuse in the previous study has risen to 8.6% in the present cohort, this increase was not statistically significant (Figure 2).

In the previous cohort, the rate of VTE prophylaxis among patients who were hospitalized for infectious diseases and acute respiratory failure was 17.1% and 5.7%, respectively. These rates have increased to 40% and 65.8%, respectively.

Discussion

In this study, we investigated whether COVID-19-related increased VTE prophylaxis awareness increased the appropriateness of VTE prophylaxis practices among the non-COVID-19 patients who were hospitalized in internal medicine wards as well and caused a "collateral benefit". We have observed a significant improvement in appropriate VTE prophylaxis rates, with a rise from 30.3% to 53.9% among medical inpatients who were deemed to be high-risk for VTE with regard to PPS, while increased VTE prophylaxis practices did not translate into statistically significant increased overuse.

As COVID-19 turned into a pandemic, clinicians have witnessed extensive hypercoagulability states associated with the disease. These ranged from VTE events such as deep vein thrombosis (DVT) and pulmonary embolism (PE) to arterial events such as stroke, myocardial infarction, and limb ischemia.[14–16,21] Although not fully understood, all three components of Virchow's triad for clot formation—endothelial injury, stasis, and hypercoagulable state—apply to COVID-19. Some experts have termed this state thromboinflammation or COVID-19-associated coagulopathy (CAC).[22]

Prevalent hypercoagulability associated with COVID-19 led clinicians to debate routine anticoagulant use, the drug of choice, dosage, and treatment length, among other things. However, the administration of enoxaparin or heparin in hospitalized COVID-19 patients was justified,[23–25] thus many consensus reports and guidelines have suggested its use.[26–29] A consensus statement based on randomized clinical trials suggests that thromboprophylaxis should be part of routine care for all COVID-19 inpatients, but the optimal dose of inpatient thromboprophylaxis is dependent upon the severity of COVID-19. A therapeutic dose of unfractionated or low molecular weight heparin is recommended after considering the patient's bleeding risk.[30] Our medical center also adopted a protocol that the physicians strictly adhere to. This included routine administration of the prophylactic dose of either unfractionated or low-molecular-weight heparin to inpatients without contraindications.[31–33]

COVID-19-related hypercoagulability and efforts to subside its untoward outcomes might have increased awareness for VTE prophylaxis practices among physicians caring for COVID-19. This increased awareness might be translated into VTE prophylaxis practices for non-COVID-19 patients as well. The dramatic increase in VTE prophylaxis practices seen among

patients hospitalized for infectious diseases and acute respiratory failure (rising from 17.1% to 40% and 5.7% to 65.8%, respectively) is also evidence that COVID-19 patients benefited greatly from increased VTE prophylaxis practices.

As far as we know, there is no observational study that shows that pharmacological VTE prophylaxis improved without any intervention in COVID-19 patients who were hospitalized but did not have COVID-19 during the COVID-19 pandemic. This study also showed that the effects of a global disaster on local health care systems can be seen through the continuous monitoring of quality measures.

We acknowledge the strengths and limitations of our study. The main strength of our study comes from the fact that we have the opportunity to compare this study's findings with those of our previous study, which had the same methodology. Since this study was conducted in a high-volume tertiary academic hospital, patients with various underlying diseases and conditions were included. Finally, strict exclusion criteria produced a more homogeneous patient cohort while removing potential confounders. We also have limitations for our study. Firstly, this study reflects single-center experience. Secondly, this study was conducted in an academic center; therefore, our findings may not be generalized to other institutions. Finally, we only included pharmacologic prophylaxis as a means of VTE prophylaxis and excluded mechanical prophylaxis.

In conclusion, we have demonstrated an unexpected and unplanned improvement of the pharmacological VTE prophylaxis practices in the general internal medicine wards during the COVID-19 pandemic, which can be addressed as a "collateral benefit." Further studies should be conducted to assess whether this observed improvement is limited to our institution and whether other collateral benefits that the pandemic brought exist.

Ethics Approval

The study was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee (Date: 29 June 2021, Decision No: GO 21/864).

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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