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ORIGINAL RESEARCH

A CLINICAL AUDIT ON VENOUS THROMBOEMBOLISM PROPHYLAXIS IN TERTIARY CARE INTENSIVE CARE UNIT

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ABSTRACT

Background: In recent decades, venous thromboembolism (VTE) has been acknowledged as a health issue that can be prevented. Among hospitalized patients, thromboembolism is a serious complication. Patients in the intensive care unit (ICU) are more susceptible to thrombotic events because of supplementary risk factors like central catheters, mechanical ventilation, and immobilization. **Aim:** This study aims to assess the appropriateness of VTE prophylaxis practices in a medical ICU of a tertiary care hospital. The IMPROVE VTE RAM was compared with clinical judgment for any significant difference in the risk assessment.

Methods: It was a retrospective cross sectional observational study carried out on the patients admitted to the medical ICU of the Vascular Surgery department from March 2023 to August 2023. Medical records and risk assessment were done using the IMPROVE VTE RAM. The prophylaxis was given to patients based on American Society of Haematology (ASH) guidelines.

Results: This was a 6 months retrospective study and a total number of 50 patients were included in the study. However, appropriate risk assessment was not done in any patient. Based on IMPROVE VTE RAM 1 patient (2%) was in low risk, 37 (74%) in moderate risk, and 12 (24%) in high risk for VTE.

Thus Prophylaxis was given to a total of 44 patients out of which 27 received unfractionated heparin and the rest of all patients received Low Molecular Weight Heparin. Mechanical prophylaxis was given to 2 patients. The regular emphasis on DVT prophylaxis and the critical care nurses' ongoing daily audit were able to commence DVT prophylaxis in the majority of patients. According to IMPROVE VTE RAM, the accuracy of clinicians' judgment in comparison to validated risk assessment tools was only 89%.

Conclusion: Critically ill admitted patients are more likely to experience VTE and bleeding episodes. Therefore adequate prophylaxis is essential but unfortunately is not routinely used in critical care settings. There is an urgent need to identify the gaps and address areas such as thromboprophylaxis and consistent care that require attention. Healthcare professionals must be

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made aware of the significance of risk assessment for bleeding and VTE in all critically ill patients, using any validated risk assessment tool.

Keywords: Chronic Health Evaluation, venous thromboembolism, prophylaxis, intensive care unit (icu)

INTRODUCTION

Venous thromboembolism (VTE) is a broad term for several ailments involving the development of blood clots in the veins. It has a significant death and morbidity rate, contributing largely to the global health burden[1]. This results in blood flow obstruction, which develops symptoms like pain, swelling, and discoloration of the skin[2]. Deep vein thrombosis (DVT) is a common symptom that appears in about 70% of people with symptomatic VTE[3].

Research indicates that thromboembolism is a risk factor for 50% of hospitalized patients[4]. Patients who did not get any prophylactic treatment had a 10% to 80% incidence of VTE[5-6]. Research has shown that hospitalized patients had a higher rate of VTE than those in the community population[7]. Critically ill patients face an elevated risk of venous thromboembolism (VTE) and therefore necessitate prompt risk evaluation and initiation of VTE prophylaxis when indicated. Without thromboprophylaxis, the likelihood of VTE development can rise to 81% in these patients, whereas with prophylactic measures, it diminishes to 44%[8]. Numerous guidelines aid clinicians in determining the necessity of VTE prophylaxis for patients. However, the availability of multiple risk assessment tools and a range of prophylactic options often results in inadequate management of VTE prophylaxis in patients.

Multiple risk assessment score models, including Caprini, Rogers, Khorana, Padua, and others, have been developed for the assessment of VTE in clinical practice. The most well-established tool for evaluating risk which has undergone extensive validation is IMPROVE VTE RAM[9]. Additionally, the IMPROVE bleeding score[10] is utilized for assessing bleeding risk and has been similarly validated.

Despite the DVT incidence in India being similar to Western countries, there is notably low awareness of VTE among Indians[11]. Newly established consensus or clinical practice guidelines offer recommendations for ongoing patient management in VTE cases, focusing on risk stratification and the proper utilization of low molecular weight heparins (LMWHs) for prophylactic purposes[12]. `

In cases where the attending physician identifies a significant risk of bleeding, mechanical thromboprophylaxis may be considered. Failure to provide suitable prophylaxis can lead to severe complications such as pulmonary thromboembolism, while inappropriate administration of anticoagulants can result in catastrophic outcomes like intracerebral hemorrhage. Despite substantial evidence supporting the benefits of VTE prophylaxis, a considerable portion, approximately 71% of patients, do not receive appropriate prophylactic measures[13].

Our study aims to assess the appropriateness of VTE prophylaxis practices in the medical ICU of a tertiary care hospital. The validated scores IMPROVE VTE RAM and Bleeding Score were compared with each other for any significant difference in the risk assessment made. Assessing this will help us find out the gaps and improve our management of patients in the future as far as VTE prophylaxis is concerned. By evaluating this, we may understand any gaps and enhance the way we manage patients going forward concerning VTE prophylaxis.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

MATERIALS & METHOD

Study Setting: This was a cross-sectional observational study design. Data was gathered from the medical records of all the patients admitted to the medical ICU of a tertiary care hospital between March 2023 to October 2023. Ethical approval for the study was obtained from the Institutional Ethical Committee. Patients with an ICU stay of fewer than 48 hours or those already receiving anticoagulation therapy were excluded from the study. Patient information, including age, gender, current medical condition, comorbidities, and whether a VTE risk assessment had been conducted, was collected from the medical records.

Risk assessment in this study relied on medical records, employing IMPROVE VTE RAM [9]. Bleeding risk was assessed using the IMPROVE Bleeding risk score [10]. Data necessary for computing these scores were extracted from medical records, and after validated risk assessment scoring, the respective scores were determined. The appropriateness of prophylaxis administered to patients was evaluated based on ASH guidelines.

Statistical Analysis:

Statistical analysis was conducted utilizing Microsoft Excel. Continuous variables were summarized using mean and Standard Deviation (SD), while categorical variables were assessed using counts and percentages, accompanied by a 95% confidence interval. The comparison between risk assessments based on the IMPROVE VTE RAM was performed using the Chi-square test, with significance set at a p-value < 0.05.

RESULTS

A total of 50 patients aged 18 years or older who were critically ill and were admitted to the ICU from March 2023 to August 2023 were included in the study. Patients with an ICU stay of less than 48 hours or already on anti-coagulation were excluded from the study. It was well ensured that out of the 50 patients, appropriate risk assessment was not done in any patient.

Out of 50 people included in the study 36 (72%) were males and 14(28%) were females as depicted in Table 1. The mean age of patients was 63.76±18.30 years as depicted in table 2 and Graph 1.

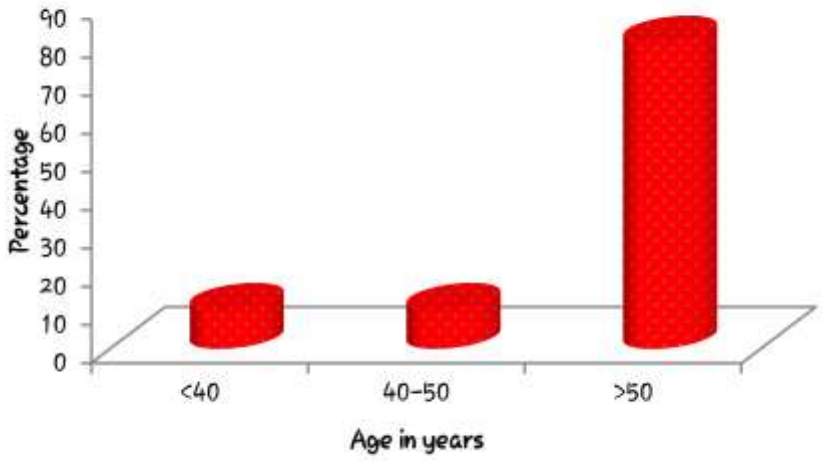
Table 1: Gender- frequency distribution of patients studied

Gender	No. of Patients	%
Female	14	28.0
Male	36	72.0
Total	50	100.0

Table 2: Age in years frequency distribution of patients studied

Age in Years	No. of Patients	%
<40	5	10.0
40-50	5	10.0
>50	40	80.0
Total	50	100.0

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024



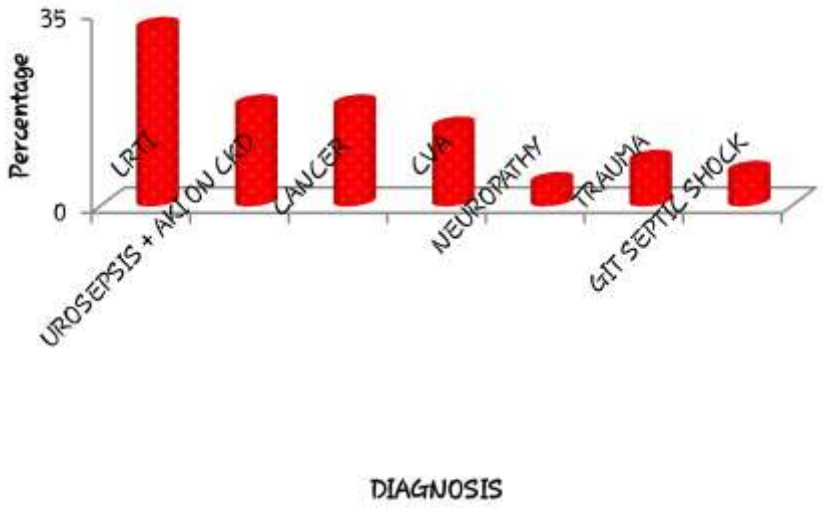
Graph 1: Frequency distribution of Age in years of patients studied

Most of the patients during admission were diagnosed with Lower Respiratory Tract Infection (32%). However Urosepsis + AKI on CKD, Cancer, cardiovascular Accidents, Neuropathy, Trauma, GIT Septic Shock were other diagnosed medical conditions as depicted in Table 3 and graph 2.

Table 3: DIAGNOSIS- frequency distribution of patients studied

DIAGNOSIS	No. of Patients (n=50)	%
LRTI	16	32.0
UROSEPSIS + AKI ON CKD	9	18.0
CANCER	9	18.0
CVA	7	14.0
NEUROPATHY	2	4.0
TRAUMA	4	8.0
GIT SEPTIC SHOCK	3	6.0

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024



Graph 2: DIAGNOSIS: Frequency distribution of patients studied

It was also witnessed that out of 50 patients 43(86%) patients were found with different co-morbidities. The common co-morbidities associated with patients were relatively Hypertension, Type-II Diabetes Mellitus, Oral Cerebrovascular Accident, Chronic Kidney Diseases, Thyrodism, and many more as depicted in Table 4.

Table 4: COMORBIDITIES- frequency distribution of patients studied

COMORBIDITIES	No. of Patients (n=50)	%
NIL	7	14.0
YES	43	86.0
• HTN	23	46.0
• T2DM	21	42.0
• OLD CVA	7	14.0
• CKD	6	12.0
• HYPOTHYROID	5	10.0
• CAD	2	4.0
• GBM	2	4.0
• CA BREAST LUMBAR SPONDYLOSIS	1	2.0
• P/CABG	1	2.0
• CERVICAL SPONDYLITIS	1	2.0
• CHOLANGIOCA	1	2.0
• DCM	1	2.0
• HAV	1	2.0
• PARKINSONISM	1	2.0
• LBA	1	2.0
• POST THR	1	2.0
• PERIAMPULLARY CA	1	2.0

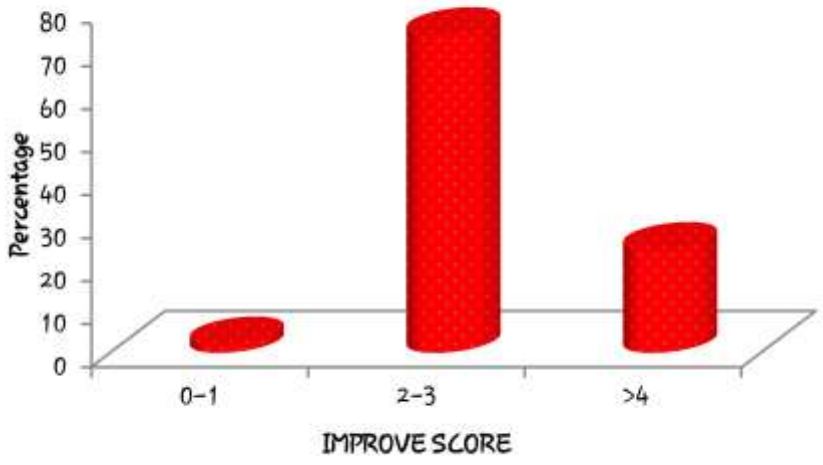
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

• ASTHMA	1	2.0
• RCC	1	2.0
• RHEUMATOID ARTHRITIS	1	2.0
• SEIZURE DISORDER	1	2.0
• ANK SPONDYLITIS	1	2.0

Improve VTE RAM:
The VTE RAM score, also known as the VTE Risk Assessment Model, assesses the risk of venous thromboembolism (VTE) in hospitalized patients. The VTE RAM score takes into account various risk factors, including age, history of VTE, recent surgery or trauma, immobilization, and certain medical conditions such as cancer or heart failure. By evaluating these factors, the VTE RAM score assigns a numerical score to each patient, with higher scores indicating a higher risk of VTE. Based on IMPROVE VTE RAM 1 patient (2%) was in low risk (Score of 0 or 1), 37 (74%) in moderate risk (Score of 2 or 3), and 12 (24%) in high risk (Score equal to or more than 4) for VTE as shown in table 5 and graph 4.
Therefore, the healthcare clinician gave prophylaxis to moderate to high-risk VTE patients. Hence one patient of low risk was left and other 49 patients of Moderate and high risk VTE were recommended ACCP-VTE prophylaxis.

Table 5: IMPROVE SCORE- frequency distribution of patients studied

IMPROVE SCORE	No. of Patients (n=50)	%
0-1	1	2.0
2-3	37	74.0
>4	12	24.0
Total	50	100.0



Graph 4: IMPROVE SCORE- frequency distribution of patients studied

However, DVT prophylaxis was given to 6 patients, and the rest 44 patients were administered prophylaxis. The most widely used prophylaxis was anticoagulants.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

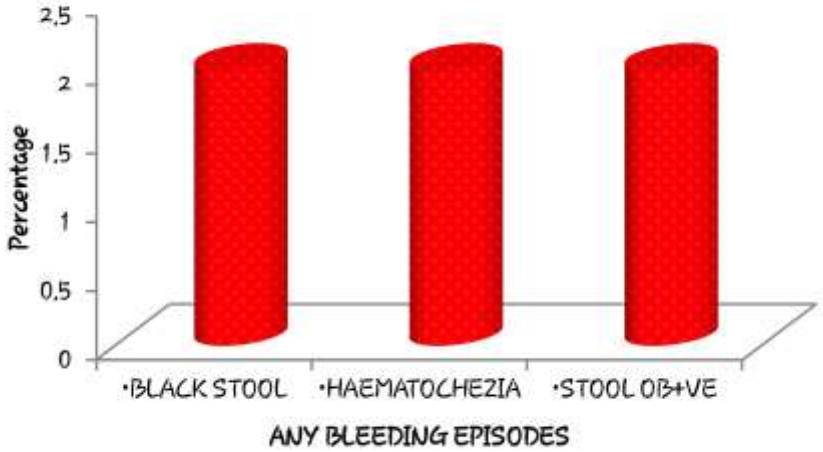
Out of 44 patients who were given Prophylaxis 16 patients (32%) were given Heparin 2500BD, 7 patients were given heparin 2500 TDS, and 4 patients were given Heparin 5000BD followed by Low molecular weight heparin (LMWH) in 15 patients (30%) and 2 patients were given mechanical prophylaxis available as depicted in table 6.

Table 6: DRUG/MECHANICAL

DRUG/MECHANICAL	No. of Patients	%
NIL	6	12.0
YES	44	88.0
• HEPARIN 2500 BD	16	32.0
• HEPARIN 2500 TDS	7	14.0
• HEPARIN 5000 BD	4	8.0
• LMWH 0.6 OD	15	30.0
• MECHANICAL IPCD	2	4.0
Total	50	100.0

Improving Bleeding Risk:

Improving the bleeding risk score involves assessing and minimizing the likelihood of bleeding complications in patients, particularly those receiving anticoagulant therapy. Based on the improve Bleeding risk assessment score there was a high risk of bleeding in 44 patients (88%) and low risk in 6 patients (12%). No Thrombotic event incidence was reported, however, 03 major bleeding episodes were recorded in high-risk patients episodes but none was related to anticoagulation but rather a disease perse (one patient with Upper Gastrointestinal (UGI) bled due to duodenal ulcer, and one patient with UGI bleed due to esophageal varices) as depicted in graph 5.



Graph 5: Bleeding Episode related to disease perse.

A very strong significant difference p value <0.05 was noticed between improved VTE risk assessment score and administration of DVT Prophylaxis or drug administration in patients recommended by the Clinician as shown in Table 7.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

Table 7: Correlation of clinical variables according to improve score of patients cohort studied

Variables	IMPROVE SCORE		Total	P Value
	<7	>7		
DVT PROPHYLAXIS				
• No	3(7.9%)	4(33.3%)	7(14%)	0.047*
• Yes	35(92.1%)	8(66.7%)	43(86%)	
DRUG MECHANICAL				
NIL	2(5.3%)	4(33.3%)	6(12%)	0.023*
YES	36(94.7%)	8(66.7%)	44(88%)	

However, it was also observed that the maximum number of patients included in the study and admitted to the ICU department were elderly as their mean age was 63.76±18.3 years. It was well indicated that there was a significant difference in P value <0.05 with bleeding score which shows that these patients are at a higher risk of thromboembolism as well as bleeding risk as shown in Table 8.

Table 8: Comparison of baseline clinical variables and outcome variables according to improve score of patients cohort studied

Variables	IMPROVE SCORE		Total	P Value
	<7	>7		
AGE IN YEARS	60.84±18.89	73±13.02	63.76±18.3	0.044*
IMRPVE BLEEDING SCORE	12.05±2.22	12.96±1.7	12.27±2.13	0.202

DISCUSSION

In our study, we have retrospectively analyzed data about critically ill patients who were admitted to the ICU of the Vascular Surgery department for six months. Out of 50 admitted patients who were included in the study majority of critically ill medical patients tend to be elderly, as evidenced by the mean age of 61.65 (±16.8) years. It was also observed that our study concludes that considering their advanced age these patients are at an elevated risk of both thromboembolism and bleeding complications.

Therefore, these patients must undergo a thorough assessment to determine the necessity of thromboprophylaxis preventive measures. However, BMI data were documented for only three patients in medical records, presumably reflecting challenges in obtaining weight measurements for bedridden patients within a critical care environment.

In this study, none of the patients underwent assessment for VTE risk using a validated tool. According to the IMPROVE VTE RAM, 37 patients (74%) were classified as moderate risk, while 12 patients (24%) were classified as high risk. However, despite this risk profile, thromboprophylaxis was administered to 44 out of 49 patients (89%) based on the treating physician's overall clinical assessment.

Interestingly, none of the patients having low risk according to the IMPROVE VTE RAM score received thromboprophylaxis. This highlights the emphasis placed on DVT prophylaxis by the ICU team and the continuous audit by critical care nurses, facilitating the initiation of DVT prophylaxis in the majority of patients.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

The clinician's judgment showed a relatively high accuracy of 89% compared to the IMPROVE VTE RAM, underscoring the importance of assessing each medical patient's VTE risk using a validated tool as early as possible upon admission to a critical care setting.

While critically ill patients typically necessitate more intensive and prolonged thromboprophylaxis, prior research has shown that only approximately half of patients in multidisciplinary critical care units (44-47%) have received such prophylaxis[14-15].

However, the ENDORSE study highlighted that only 39.5% of all medical patients at high risk for VTE received any form of thromboprophylaxis. Specifically in India, the data revealed that merely 17.4% of high-risk patients received thromboprophylaxis[16]. Another study conducted by Parikh KC et al. found that 20% of patients who required thromboprophylaxis did not receive it[17]. These findings underscore the critical importance of risk assessment, which should be routinely practiced by all critical care physicians.

Regardless of the specific risk assessment tool utilized, the implementation of thromboprophylaxis practices can be enhanced by adhering to any validated risk assessment tool to determine the necessity of thromboprophylaxis for VTE. The primary reason for the underutilization of thromboprophylaxis may commonly be attributed to concerns regarding bleeding complications, which serve as contraindications to anticoagulant therapy.[18] In this study, a notably higher percentage of patients (88%) were found to have a high bleeding risk which is likely attributed to the clinical profile of ICU medical patients, who often present with multiple comorbidities and are on various medications, rendering them more susceptible to experiencing bleeding episodes.

However, it's important to note that the inadequate use of thromboprophylaxis cannot solely be explained by contraindications to anticoagulant use, as mechanical thromboprophylaxis was also underutilized. Previous evidence has indicated that Low Molecular Weight Heparin (LMWH) is equally effective and safe compared to Unfractionated Heparin (UFH) for the treatment of VTE.[19-20] Nevertheless, LMWH is often preferred over UFH due to its lower incidence of thrombocytopenia and osteoporosis during long-term use, despite its higher cost.

Limitation

No cases of VTE were observed in the current study. However, due to the limited follow-up duration until discharge or day 28, as well as the relatively small sample size, it would be relatively difficult to conclude a reduced risk of VTE among critically ill patients based solely on these findings. It's essential to acknowledge that this study was conducted at a single center, highlighting the need for larger-scale data collection from multiple hospitals to gain a more comprehensive understanding of VTE risk in this patient population.

CONCLUSION

In recent years, there has been a notable increase in the occurrence of VTE cases within the Asian population. Critically ill medical patients face elevated risks of both VTE and bleeding episodes, underscoring the crucial need for appropriate prophylaxis in critical care settings. However, current practices often fall short in this regard. There is a pressing necessity to raise awareness among healthcare providers regarding the significance of conducting risk assessments for both VTE and bleeding in all critically ill patients, utilizing validated risk assessment tools. This proactive approach holds significant potential in mitigating morbidity and mortality among these patients.

This rise can be attributed to advancements in the prompt detection of VTE and the subsequent adoption of thromboprophylaxis treatments to address this issue. As a result, there has been a decline in thromboembolic episodes, even among individuals at high risk for VTE.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 6, 2024

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