



Assessment of risk of deep vein thrombosis among patients admitted in ICU by risk analysis scoring at a tertiary care center

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Abstract

Background: Deep vein thrombosis (DVT) is a serious condition that can be life-threatening. However, it's largely preventable and treatable if discovered early. In recent years, great effort has been made to establish risk assessment models (RAMs) to identify patients with high and low risks for various outcomes. Present study was aimed to study assessment of risk of deep vein thrombosis among patients admitted in ICU by risk analysis scoring at a tertiary care center. **Material and Methods:** Present study was single-center, point prevalence study, conducted in patients admitted in ICU, patients analysis done once a week. A structured proforma was designed for risk assessment and stratification of DVT risk was calculated as per risk analysis score. **Results:** In present study, 100 patients were screened. Majority were from 50-59 (25 %) & 70-79 years age group (20 %), were male (66 %) & had normal BMI (18-25 kg/m²) (59 %). Among study patients, common provisional diagnosis were AKI on CKD/with sepsis (19 %), pneumonia (11 %), malignancy (13.33 %) & CKD with/without sepsis (10 %). Total no of high risk cases deserving prophylaxis were 70 (70 %) (highest & high risk), others were moderate (17 %) & low-risk (13 %). 82 patients (82 %) received deep vein thrombosis prophylaxis. Common reasons for not giving prophylaxis (n=18) were low platelet count (55.56 %), active bleeding (27.78 %), Early ambulation (11.11 %) & on hemodialysis (5.56 %). Among study patients, no DVT observed, thus 100 % success observed among who received DVT prophylaxis according to risk scoring analysis. **Conclusion:** Risk analysis scoring is helpful to improve assessment of risk of deep vein thrombosis among patients admitted in ICU compared with usual practice.

Keywords: Risk analysis scoring, risk of deep vein thrombosis, ICU patients, LMWH

Introduction: Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is an important cause of morbidity and mortality in critically ill patients.¹ DVT is a serious condition that can be life-threatening. However, it's largely preventable and treatable if discovered early.

Critically ill patients are at increased risk of VTE due to predisposing premorbid conditions, occurrence of sepsis, trauma, and post-admission events.² Reduced blood flow caused by prolonged periods of inactivity, especially in older adult subjects, long hospitalizations due to illness, pregnancy, and long-distance travel with limited movements,

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such as air travel, are associated with increased risk of DVT.³ Other factors were independently associated factors with VTE in the acute hospitalized patients are heart or respiratory failure, infections, rheumatic disorder or inflammatory bowel disease.⁴

Detailed meta-analysis of all clinical trials to assess the efficacy of DVT prophylaxis in preventing adverse events like DVT/PE have shown a significant reduction (57% risk reduction) in risk for any PE. In recent years, great effort has been made to establish risk assessment models (RAMs) to identify patients with high and low risks for various outcomes. Present study was aimed to study assessment of risk of deep vein thrombosis among patients admitted in ICU by risk analysis scoring at a tertiary care center.

Material And Methods

Present study was single-center, point prevalence study, conducted in department of general medicine, at XXX medical college & hospital, XXX, India. Study duration was of 1 year (January 2022 to December 2023). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- All patients admitted in ICU were considered for this study, all patients analysis done once a week
- Willing to participate in present study

Exclusion criteria

- Patients who had been on DVT prophylaxis within one month of their admission
- Patient or attendant not willing to participate

Study was explained to patients/attendants in local language & written consent was taken for participation & study. Demographic data including patient's age, sex, and body weight were collected. Other baseline information like admitting diagnosis, any invasive instrumentation Alike ventilator, venous catheters, etc were also noted down. Patients were examined for any clinical signs and symptoms of DVT or PE. Any prophylaxis given and relevant investigations for DVT (D-dimer, Doppler ultrasound, high resolution chest computed tomography [CT], pulmonary angiography) that was done during this time interval was also noted.

A structured proforma was designed for risk assessment and stratification of DVT in patients admitted in ICU, using a previously published standard protocol by risk analysis scoring. The risk assessment and stratification scorecard used is as follows.

Table 1: RISK ANALYSIS SCORE

A (Each Risk Factor Represents 1 Point)		
Age 41-60 years	•Varicose veins (< 1 month)	• Leg plaster cast or brace
• Congestive heart failure (< 1 month)	History of inflammatory bowel disease	• Acute myocardial infarction (< 1 month)
• Medical patient currently at bed rest	• Abnormal pulmonary function (COPD)	• Serious lung disease incl. pneumonia
•Sepsis (< 1 month)	Swollen legs (current)	• Obesity (BMI > 30)
• History of prior major surgery	• Minor surgery planned	• Other risk factors
Total Score A		
B (Each Risk Factor Represents 2 Points)		
Age 60-74 years	• Previous malignancy	• Morbid obesity (BMI > 40)
• Major surgery (> 60 minutes)	• Arthroscopic surgery (> 60 minutes)	• Laparoscopic surgery (> 60 minutes)
Central venous access		

Total Score B		
C (Each Risk Factor Represents 3 Points)		
Age over 75 years	History of SVT, DVT/PE	Family history of DVT/PE
BMI >50 (venous stasis syndrome)	•Present cancer or chemotherapy	•Heparin-induced thrombocytopenia (HIT)
Major surgery lasting 2-3 hours	Elevated serum homocysteine	Positive Prothrombin 20210A
Elevated anticardiolipin antibodies	Positive anticonagulant	Lupus Other thrombophilia Type _____
Positive Factor V Leiden		
Total Score		
D (Each Risk Factor Represents 5 Points)		
• Elective major lower extremity arthroplasty	• Acute spinal cord injury (paralysis) (< 1 month)	• Major surgery lasting over 3 hours
• Multiple trauma (< 1 month)	Hip, pelvis or leg fracture (<1 month)	• Stroke (<1 month)
Total Score		
E - For Women Only (Each Represents 1 Point)		
• Oral contraceptives or hormone replacement therapy	• Pregnancy or postpartum (< 1 month)	History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth-restricted infant
Total Score		
TOTAL SCORE – A + B + C + D + E.		

Effective risk stratification for DVT was done in low, moderate, high, and highest categories according to the patients DVT risk score at their time of admission.

Table 2: Recommended Prophylactic Regimens for Each Risk Group

Incidence of DVT	Total Score	Risk Category	Recommended Regimen
<10%	1	Low	<ul style="list-style-type: none"> No Specific measures Early Ambulation
10-20%	2	Moderate	<ul style="list-style-type: none"> LDUFH (every 12h), LMWH, IPC and GCS
20-40%	3-4	High	<ul style="list-style-type: none"> LDUFH (every 8h), LMWH and IPC GCS (+LDUFH or LMWH)
40-80% 1-5% mortality	≥ 5	Highest	<ul style="list-style-type: none"> LMWH, Oral anticoagulants, Adjusted dose heparin IPC (+LDUFH or LMWH), GCS (+LDUFH or LMWH)

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

Results

In present study, 100 patients were screened. Majority were from 50-59 (25 %) & 70-79 years age group (20 %), were male (66 %) & had normal BMI (18-25 kg/m²) (59 %).

Table 3: General characteristics

	No. of patients	Percentage
Age groups (in years)		

< 30	9	9
30-39	10	10
40-49	11	11
50-59	25	25
60-69	16	16
70-79	20	20
>80	9	9
Mean age (mean \pm SD)	59.67 \pm 11.35	
Gender		
Male	66	66
Female	34	34
BMI		
<18	7	7
18-25	59	59
>25	34	34

Among study patients, common provisional diagnosis were AKI on CKD/with sepsis (19 %), pneumonia (11 %), malignancy (13.33 %) & CKD with/without sepsis (10 %).

Table 4: Provisional Diagnosis

Provisional Diagnosis	No. of patients	Percentage
AKI on CKD/with sepsis	19	19
Pneumonia	11	11
Malignancy	10	10
CKD with/without sepsis	10	10
ACS	7	7
COPD	6	6
Urosepsis	6	6
Stroke	5	5
POST operative	4	4
Dengue fever	2	2
Sepsis/Pyelonephritis	2	2
Rickettsial fever with TCP	2	2
Others	16	16

In present study, total no of high risk cases deserving prophylaxis were 70 (70 %) (highest & high risk), others were moderate (17 %) & low-risk (13 %).

Table 5: TOTAL SCORE

TOTAL SCORE	Risk Category	No. of patients	Percentage
≥ 5	Highest	52	52
3-4	High	18	18
2	Moderate	17	17
0-1	Low	13	13

82 patients (82 %) received deep vein thrombosis prophylaxis. Common reasons for not giving prophylaxis (n=18) were low platelet count (55.56 %), active bleeding (27.78 %), Early ambulation (11.11 %) & on hemodialysis (5.56 %). Among study patients, no DVT observed, thus 100 % success observed among who received DVT prophylaxis according to risk scoring analysis.

Table 6: Reason for not giving prophylaxis

Reason for not giving prophylaxis	No. of patients (n=18)	Percentage
Low platelet count	10	55.56
Active bleeding	5	27.78
Early ambulation	2	11.11
On hemodialysis	1	5.56

Discussion

All critically ill patients in the ICU should be considered to be at moderate to high risk for DVT. All patients should be evaluated for bleeding risk. As there is no bleeding risk scoring system which is validated for ICU patients, the panel recommends analysis of the number of bleeding risk factors by obtaining a detailed history, clinical examination, and investigation.⁶

National quality organizations in the United States have opted for a group risk assessment and thromboprophylaxis strategy in the hospitalized medical patient^{7,8}; however, recent international guideline statements have stressed the need for individualized VTE risk assessment through the use of VTE risk assessment models (RAMs) in the acutely ill medical patient population.^{7,9} This would allow proper identification of medical patients at risk of VTE and minimize potential harm from thromboprophylaxis for patients at low risk of VTE.⁹

The Indian data from ENDORSE study revealed that despite a similar proportion of patients at risk in India and other participating countries, there is major underutilization of prophylaxis (17.4%) in India as compared to prophylaxis globally (50.2%).¹⁰

Heit and colleagues¹¹ noted conditions related as major risk factors for developing DVT: increasing age, male gender, surgery, trauma, confinement in hospitals or nursing homes, malignancy, neurologic disease, central venous catheter, prior superficial vein thrombosis, and varicose veins.

It is necessary to identify individuals who are at increased risk of VTE, either for implementing preventive measures targeted at high-risk groups or for timely initiation of appropriate thromboprophylaxis.^{12,13} Several risk assessment models (RAM) such as Caprini, Padua prediction score, Geneva risk score, International Medical Prevention Registry on Venous Thromboembolism (IMPROVE), Khorana, are in use in clinical practice to stratify patients at risk for VTE.^{14,15}

In study by Patel VB et al.,¹⁶ as per SMART assessment score 4.5%, 41.8%, 6% and 23.9% had no, moderate, high and highest risk of developing DVT. As per the pretest probability scores 76%, 20.9% and 3% were in low, moderate and high-risk group. Both scoring systems are comparable (p=0.001). There was significant association between paralysis (p value was 0.003), central venous access (p value was 0.006), patient bed ridden for >72 hours (p value was 0.009) and risk group. Prolonged bed rest, paralysis and central venous access are the most important contributing conditions for high risk of DVT.

In study by Pandey A et al., 75 % of patients had the highest risk for DVT and PE. Only 12.5% had DVT prophylaxis within the first two days of admission. Within two weeks of admission, 30.8% of patients were discharged, and 16.2% died. 72.6% of the patients still in the wards belonged to the highest risk category. Clinical signs and symptoms of DVT and PE were present in 25.8% and 9.8% of patients, respectively after the second week of admission. A statistically significant correlation was found between mortality and risk score of the patients for DVT and between lack of prophylaxis and mortality.

Primary prevention of VTE with risk assessment and stratification for DVT and subsequent antithrombotic prophylaxis in moderate to severe risk category patients is the most rational means of reducing mortality and morbidity. Continuous training is required to doctors and staff nurses about risk factors for DVT, monitoring signs and symptoms for early diagnosis in order to avoid further potential complications. In ICUs, weekly assessment of risk factors and thromboprophylaxis regimen is recommended.

Conclusion

Risk analysis scoring is helpful to improve assessment of risk of deep vein thrombosis among patients admitted in ICU compared with usual practice. However, its validity requires proper confirmation and validation from other large prospective studies.

Conflict of Interest: None to declare

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