Available online on 15.09.2023 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

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Research Article

A Comparative Study on Caprini RAM Vs DOH Tool for Thromboprophylaxis in ICU Setting at Tertiary Care Hospital

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Article Info:

Article History:

Received 14 June 2023
Reviewed 03 Aug 2023
Accepted 21 Aug 2023
Published 15 Sep 2023

Cite this article as:

Bharathi Priya K, Harine G, Pavithra A, Jayakumar D, Farazuddin M, Tejaswini S, A Comparative Study on Caprini RAM Vs DOH Tool for Thromboprophylaxis in ICU Setting at Tertiary Care Hospital, Journal of Drug Delivery and Therapeutics. 2023; 13(9):55-61

DOI: http://dx.doi.org/10.22270/jddt.v13i9.6198

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Abstract

The aim of the study was to assess DVT prophylaxis using two models (Caprini RAM & DOH tool) for the prevention of DVT in postoperative or critically ill patients and for better predictability of disease. In this prospective observational study, we compared the Caprini RAM and DOH tool in the ICU setting on 229 patients (140 men and 89 women). 205 patients were considered in the study, out of which 97 had Caprini RAM and 108 had DOH tool. A Prospective, observational comparative study was carried out in a tertiary care hospital for a period of 6 months. Patients were divided into two groups according to the RAM. The data were analyzed using SPSS software and the results were compared using the student t-test. Both GROUP A and GROUP B revealed that the majority of the patients (67.1% & 55.6%) were above 60 years and a large proportion of them required DVT prophylaxis. In GROUP A 93% of forms were complete with 79% accuracy. In GROUP B 83% were complete. The most appropriate prophylaxis received by patients was Enoxaparin sodium 40 mg OD for about 97 (30%) patients and Heparin 5000 IU BD for 108 (30%) based on their Caprini scores and NICE guidelines respectively. The majority of patients in Group A did not require dosage adjustments, but in 20% of cases, it was necessary. Statistical significance was achieved with a p-value less than 0.05. The study demonstrates DOH tool is better than Caprini RAM to be used in hospitals, for risk assessment of VTE in both medical and surgical patients for accuracy and predictability of the prophylaxis.

Keywords: DVT, Risk assessment, Caprini RAM, DOH tool, pharmacological and mechanical Prophylaxis.

INTRODUCTION:

Venous thromboembolism (VTE) is a potentially fatal disorder and is known as blood clot in veins, it comprises Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE) [1,2]. Deep vein thrombosis is the blood clot (thrombus) in the deep vein, usually in the lower extremities but it can also occur in the arms [3]. A pulmonary embolism usually occurs when a blood clot in a deep vein in the leg or pelvis breaks loose and travels through the blood to the lungs [4]. The annual incidence of VTE is estimated to be 1-2 per 1000[5]. After the first DVT incidence, the mortality in a month period is to be 5-10% and after the first PE, it is about 8-16% [5,6,7]. There is a high prevalence of VTE (50%) when there is an absence of appropriate prophylactic treatment [8]. VTE prophylaxis has favorable outcomes in minimizing morbidity and mortality. The standard care for thromboprophylaxis is VTE prophylaxis in the ICU setting. Individualized VTE risk assessment determines the methods of prophylaxis for individual patients based on the risk thus the prophylaxis can be mechanical or pharmacological measures [9].

There are multiple quantitative VTE RAMs available in clinical practice. The ninth edition of the American College of Chest Physicians Antithrombotic Therapy and Prevention of Thrombosis guideline (AT9) has acknowledged the Caprini score [10]. Caprini RAM has derived more than a decade ago, depending upon both clinical experience and published data. Using this RAM, each patient was given a score based on their co-morbidities and perioperative risk. They have independent factors with certain points ranging from 1-5 based on the risk for VTE [11]. One or more points were assigned according to individual risk factors of their relative risk which results in a thrombotic event. This will help the physicians to categorize the patients into low, moderate, and high-risk, bleeding risks based on the thrombosis event. Using the categorization, the type, duration, and strength of prophylaxis can be adjusted. The VTE event of each group will be compared to the patient's risk of bleeding, resulting in appropriate prophylaxis. The Department of Health initiated a National VTE Prevention Programme to reduce avoidable death and chronic illness from hospital-acquired VTE [12]. This tool recognizes all medical and surgical patients who are at risk of VTE. The simplicity of this tool makes it clear and ideal for clinical use, although it fails to cover a huge number of factors that increases the risk of VTE. This tool is often related to both patients related and admission-related risk factors.

MATERIALS AND METHODS:

A Prospective, observational, comparative study, over a period of 6 months was carried out in a Tertiary care hospital, Chennai, Tamil Nadu. It is a 300+ bed tertiary care hospital with 15+ medical departments. The literature review has been done for the respective topic with assessing the aim and objective of the study. Using the literature review the ethics protocol has been prepared by determining the sample size, target population, and methodology. The patient data collection form is prepared for both the tools [Caprini RAM & DOH Tool (NICE guidelines)]. After ethics approval, sample collection was started. Patients admitted to ICU with a stay greater than 48hrs were included in the study and all these patients had a completed checklist of VTE risk assessment tools (Caprini RAM or DOH). All assessed patients received appropriate VTE prophylaxis in concordance with their assessment category.

The patients in the ICU are divided into two groups [Group A & Group B] Group A: Group A patient's case sheets contain the Caprini Risk assessment model which is stratified for risk and scored according to their history. Based on their scores, they were categorized into very-low, low, moderate, or high risk and will be provided with appropriate VTE prophylaxis. The details such as age, diagnosis, height weight, and serum creatinine, as per Caprini RAM are collected from the patient's records. With the scores, appropriate prophylaxis was assessed and audited. Using serum creatinine value, creatinine clearance will be calculated and dosage adjustments are made if any. By escalating to the ICU Intensivist, therapy initiation/ modifications regarding anticoagulant agents are made.

Group B: Group B patient's case sheet contain the Department of Health (DOH) tool which was analyzed according to the patient's history. The risk is analyzed for appropriate Pharmacological or Mechanical prophylaxis. The details such as age, diagnosis, height, weight, and serum creatinine are collected from the patient's records. Using serum creatinine value, creatinine clearance will be calculated and dosage adjustments are made if any. By escalating to ICU Intensivist, therapy initiation/ modifications regarding the anticoagulant agents are made. The signs and symptoms of VTE were evaluated on the 3rd, 7th, 14th, and 30th days in patients who remain in inpatient care. In patients with suspected VTE, documented diagnostic tools will be observed and documented.

The data were entered in the prepared Google forms which contain all the required parameters. As Group A and Group B have unequal samples the sample was taken randomly for statistics. Group A and Group B data were compared using student t-tests and analysed using SPSS software.

Target Population: The patient who is admitted to ICU for medical and surgical management and receiving DVT prophylaxis (pharmacological or mechanical treatment) with a risk assessment tool for VTE (Caprini RAM or DOH tool).

Inclusion Criteria: Adult patients (age ≥ 18 years), admitted to any of the ICU units for at least 24 hours, with an expected length of stay (LOS) of at least 48 hours.

Exclusion Criteria: Heparin-induced thrombocytopenia, Hypersensitivity to UFH and uncontrolled hypertension, Active bleeding.

Sample Size: 229 patients.

Ethical Consideration: The study proposal was approved by the Institutional Ethical Committee of Dr Kamakshi Memorial Hospital, Chennai and approval No. IEC-CS 22A/BC134/2022 and IEC-CS 22A/BC-135/2022. This study was carried out only in the ICU setting. All the information collected from the patient's case sheet has been kept confidential. All provisions of the Declaration of Helsinki were followed in this study.

RESULTS:

Out of 205 patients, 97 patients had the Caprini risk assessment model and 108 patients had the DOH tool. They were divided into Group A and Group B in ICU. Group A – CAPRINI RAM and Group B-DOH tool and their risk for VTE were categorised according to the respective criteria listed in the form. VTE prophylaxis was given according to the guidelines.

The demographic data of the patients who participated in the study, such as their age, gender, height , and weight, was gathered. Out of 205 patients, 108 were evaluated using the DOH tool and 97 were evaluated using the Caprini risk assessment model.

Regarding age, the majority of patients were found to be in the age group of 60-80 years. The descriptive analysis of age (Table 1) revealed that the mean age was 63.23 ± 14.193 for patients assessed using the Caprini RAM and 61.19 ± 16.856 for those assessed using the DOH tool. A paired sample t-test showed that there was a statistically significant (0.001) difference between the mean ages of the two groups and it shows the mean and SD as 2.041 and 3.648 respectively in the paired difference of t- test.

In terms of gender, 63% of the patients were male, and 37% were female. The descriptive analysis for gender (Table 2) showed that among patients assessed using the Caprini RAM, 62.9% were male and 37.1% were female. Among patients assessed using the DOH tool, 58.3% were male, and 41.7% were female.

Table 1: Descriptive Analysis of Age (N=205)

	CAPRINI RAM(N=97)				DOH TOOL(N=108)			
Age Group (Years)	Frequency (N=97)	Percentage (%)	Mean ± SD	Confidence Interval (95%)	Frequency (N=108)	Percentage (%)	Mean ± SD	Confidence Interval (95%)
16-26	1	1	21.60 ± 1.817		5	4.6	0	19.34 - 23.86
27-37	7	7.2	32.86 ± 2.610	28.66 - 35.62	7	6.5	32.14 ± 3.761	30.44 - 35.27
38-48	4	4	43.82 ± 3.459	37.99 - 48.51	11	10.2	43.25 ± 3.304	41.49 - 46.14
49-59	24	16.4	55.92 ± 2.565	52.55 - 56.45	13	12.0	54.50 ± 3.657	54.37 - 57.97
60-70	28	37.4	63.88 ± 3.250	63.30 - 65.64	32	29.6	64.47 ± 3.452	62.70 - 65.05
71-81	29	29.9	74.97 ± 3.077	73.85 - 76.02	33	30.6	74.93 ± 2.853	73.88 - 76.06
82-92	4	4.1	85.14 ± 2.854	83.50 - 92.50	7	6.5	88.50 ± 2.828	82.50 - 87.78

Table 2: Descriptive analysis for gender

	CAPRINI RAM(N=97)		DOH TOOL(N=108)	
Gender	**Frequency (N=97)**	**Percentage (%)**	**Frequency (N=108)**	**Percentage (%)**
Male	61	62.9	63	58.3
Female	36	37.1	45	41.7

Regarding weight, the majority of patients were found to be in the weight range of 61-70 kg. The descriptive analysis of weight (Table 3) revealed that the mean weight was 63.39 ± 11.057 for patients assessed using the Caprini RAM and 63.24 ± 11.372 for those assessed using the DOH tool. There was a statistically significant difference in the mean weight between the two groups and it shows the mean and SD as 4.227 and 13.114 respectively in the paired difference of the t-test.

Table 3: Descriptive Analysis for Weight (N=205)

	CAPRINI RAM (N=97)				DOH TOOL (N=108)			
Weight Group (Kg)	Frequency (N=97)	Percentage (%)	Mean± SD	Confidence Interval (95%)	Frequency(N=108)	Percentage (%)	Mean± SD	Confidence Interval (95%)
40-50	8	8	47.22 ± 3.632	44.43 - 50.01	24	22	48.08 ± 2.65	46.96-49.20
51-60	23	24	57.26 ± 2.340	56.25 - 58.27	31	29	57.19 ± 2.272	56.36 - 58.03
61-70	50	52	67.54 ± 2.187	66.92 - 68.16	40	37	67.28 ± 2.755	66.39 - 68.16
71-80	16	16	77.00 ± 2.619	75.55 - 78.45	10	9	74.70 ± 2.163	73.15 - 76.25
81-90		0	0	0	2	2	85.80 ± 0.00	85.00 - 85.00
91-100		0	0	0	1	1	0	0

Based on Table (4) it appears that the majority of patients in the study were between 160-170cm in height, followed by 150-160cm. The descriptive analysis shows that for both the Caprini RAM and DOH TOOL groups, the mean height was within the 160-170cm range, with the Caprini RAM group having a slightly higher mean height of 163.38cm compared to the DOH TOOL group's mean height of 161.68cm. However, the paired sample t-test shows that the difference in mean height between the two groups is not statistically significant (p = 0.201). Therefore, it can be concluded that there is no significant difference in height between the patients who received prophylactic treatment according to Caprini RAM and those who received treatment according to DOH guidelines.

Table 4: Descriptive Analysis for Height (N=205)

	CAPRINI RAM				**DOH TOOL**			
Height Group(Cm)	Frequency (N=97)	Percentage (%)	Mean± SD	Confidence Interval (95%)	Frequency(N=108)	Percentage (%)	Mean± SD	Confidence Interval (95%)
140-150	4	4	150 ± 0.000	150.00 - 150.00	8	7	149.38 ± 1.768	147.90 - 150.85
151-160	28	29	158.43 ± 2.348	157.52 - 159.34	47	44	157.19 ± 2.281	156.52 - 157.86
161-170	55	57	167.11 ± 2.865	166.33 - 167.88	52	48	166.54 ± 2.469	165.85 - 167.23
171-180	10	10	172.60 ± 1.265	171.70 - 173.50	1	1	0	0

The main objective of the study was to assess and compare the predictive ability of risk of VTE in patients in ICU setting. Risk assessment, form filling, form appropriateness, Caprini scores, DOH (NICE guidelines), treatment, and drug appropriateness for VTE prophylaxis in 205 patients as been assessed.

The percentage of Caprini RAM form filling (figure 1) was 93%(n=90), and DOH form filling was 82.4%(n=89). The form appropriateness for Caprini RAM was 79%, and for DOH, it was 77%. The paired t-test for form appropriateness showed no significant difference between Caprini RAM and DOH (p=0.726).

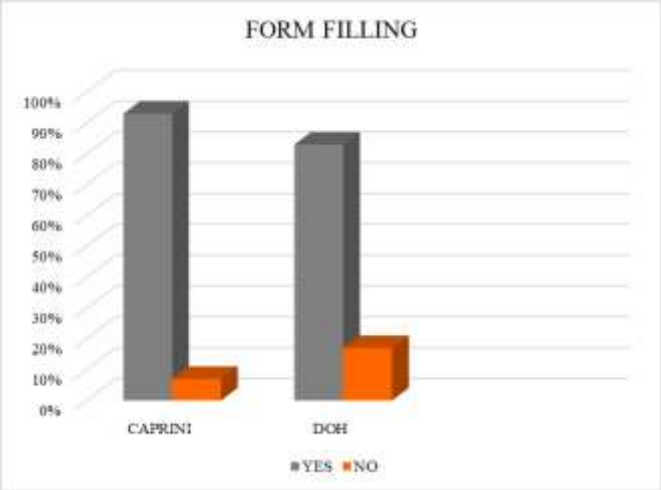

Figure 1: Percentage distrubution of CAPRINI RAM and DOH tool

Out of 97 patients, 9 patients had a Caprini score of 1, which indicates very low risk, out of which 2 of them received pharmacological prophylaxis, which is not a common form of prophylaxis according to the Caprini RAM, and 7 patients had no prophylaxis at all, as determined by the Caprini scores. According to Caprini, patients with a score of 2 should get pharmacological or mechanical prophylaxis, however, 2 of the 11 patients didn't receive it. Patients with scores of more than or equal to 5 are considered high risk, and out of 32 patients, 4 patients didn't receive any prophylaxis. Patients with scores of 3 to 4 are considered the intermediate risk, and out of 41 patients, 4 patients had no prophylaxis which is not as determined by Caprini RAM. Few patients didn't receive prophylaxis due to decreased platelet count (<1,50,000). Due to misinterpretation, some patients didn't receive prophylaxis and required initiation of therapy. On the other hand, out of 108 patients who received the DOH form, 47 patients had normal renal clearance and 61 patients had abnormal renal clearance. According to NICE guidelines, the patients received their prophylactic treatment based on their serum creatinine range.

The majority of patients with Caprini scores received ENOXAPARIN SODIUM 40 mg, around 40%(n=36) in 97 patients. The patients with DOH (NICE guidelines) received HEPARIN 5000 IU in high numbers, around 50% (n=58) in 108 patients. (Table 5)

Table 5: Descriptive Analysis for Treatment

	CAPRINI RAM		DOH TOOL	
Pharmacological and Mechanical Prophylaxis	**Frequency (N=97)**	**Percentage (%)**	**Frequency (N=108)**	**Percentage (%)**
Enoxaparin Na 40 mg	36	37	18	17
Enoxaparin Na 60 mg	2	2	10	9
Heparin 5000 IU	25	26	58	54
Heparin 2500 IU	0	0	4	4
Mech Prophylaxis (TEDS)	14	14	4	4
Mech Prophylaxis (SCDS)	2	2	0	0
Apixaban 2.5 mg Tab	1	1	0	0
Nil Prophylaxis	17	18	14	13

In Group A, 18% of the patients do not require any prophylaxis because they can mobilize and have a very low risk of between 0-1. Furthermore, 13% of patients in Group B did not need preventative care, as per NICE recommendations, because they can mobilize, as noted in the risk assessment form. From the observation, mechanical prophylaxis, such as TED stockings are effective in low-risk patients, and SCD is applied to patients who underwent craniectomy. Mechanical prophylaxis was utilized by 20% of patients in Group A, and 10% of patients in Group B. (figure 2)

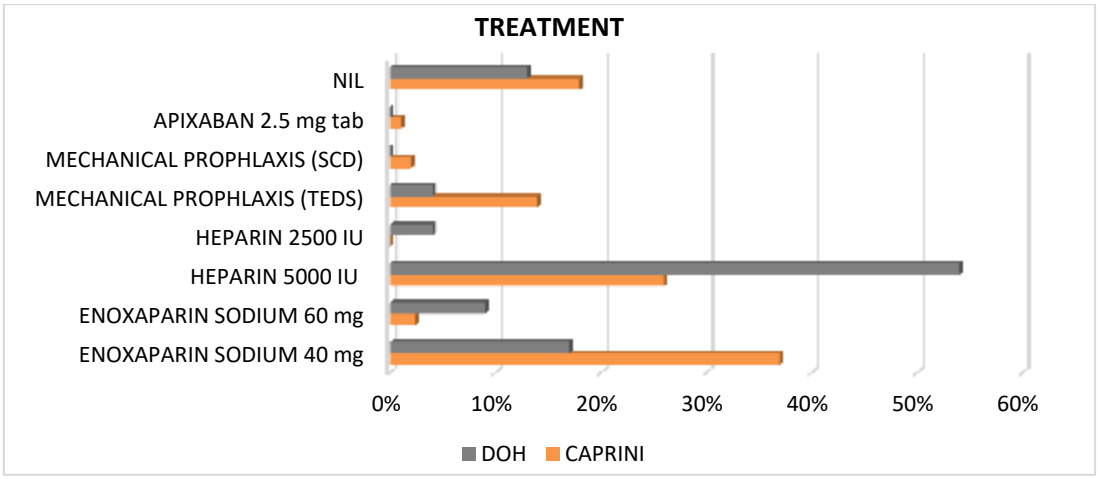

Figure 2: Percentage distribution for treatment

The pharmacological appropriateness (figure 3) for Caprini RAM revealed that, while there was a deviation in the therapy for 23% of the patients, the treatment given in accordance with the criteria was more appropriate for 77% of the patients. Only 2% of patients received treatment that was not appropriate in 98% of the cases, according to DOH. The results of every patient's VTE laboratory test, including the INR, prothrombin time, and D-dimer, were all normal.

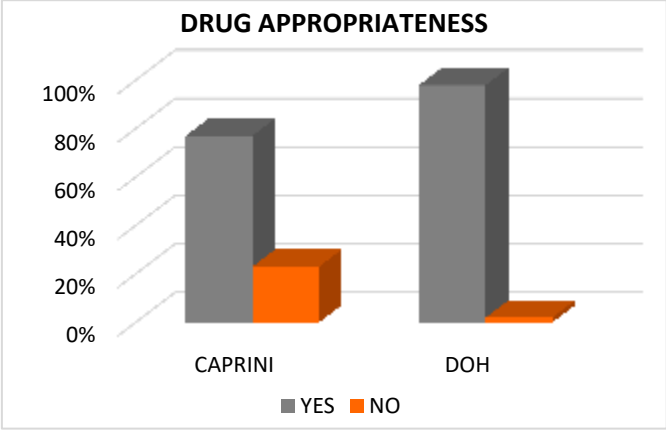

Figure 3:Percentage distribution of drug appropriateness

Only 20% of patients in the Caprini RAM group required dose adjustments, compared to just 1.9% of patients in the DOH group, who required dosage adjustments.

The risk stratification in Group A was incorrect (21%) for several reasons, including incorrect scoring, improper risk categorization, and the absence of reassessment of the form following surgery. Similar to Group A, Group B also exhibited some inappropriateness (23%), such as improper form filling. The pharmacological appropriateness for VTE prophylaxis was lower in Group A compared to Group B. During the study period, the deviations were found to be 23% in Group A, and 2% in Group B which was intimated to the intensivist.

None of the patients in either group developed symptoms of VTE after the initiation of prophylactic therapy, and none had a fatal incident due to VTE. However, 18% of patients in the Caprini RAM group had deviations in therapy initiation and modification, which were intimated to ICU intensivists, while only 2% of patients in the DOH group had such deviations intimated to ICU intensivists.

DISCUSSION:

Appropriate VTE prophylaxis in inpatients helps reduce the risk of post-thrombotic complications and fatal and non-fatal Pulmonary embolism (PE) and Deep vein thrombosis (DVT). VTE risk assessment balances the risk of thrombosis against the risk and consequences of bleeding. To assess the clinical practice of health professionals during education and training, they are utilized to define clinical standards. The main goal of this review is to describe the precise pharmacologic characteristics of the anticoagulants that are suggested for mechanical therapy and prevention against VTE. And to provide a summary of current recommendations for thromboprophylaxis across distinct critically ill patient populations, to reduce VTE and promote appropriate prophylaxis to at-risk patients in the hospital setting using the risk assessment stratification. The main objective is to enhance the quality of life of the patients while adhering to both the Caprini risk assessment model and the Department of Health VTE risk assessment tool. And the primary goal of the study is to ensure that ICU patients receive effective prophylaxis in accordance with their risk factors (i.e. appropriate drug with a suitable dosage form).

As the RAM accurately predicts the patients' risk level, it may also identify disease-specific risk factors and help to prescribe the appropriate thromboprophylaxis. Using RAM may help in simplified decision-making by the physician.

The present study 'Comparison of two different risk assessment models for preventing Venous Thromboembolism (VTE)' was carried out on two hundred and twenty- nine patients (male=140; female=89) in an ICU of a tertiary care hospital.

Out of the 229 patients, twenty-four were excluded from the study. Eight patients had accelerated hypertension and ten patients had active bleeding, the two primary exclusion criteria of the study. Six patients with a prior history of VTE who were admitted to the ICU for the treatment of recurrent VTE were also excluded. The remaining 205 patients were divided into two groups; Group A (those receiving prophylactic treatment following the Caprini risk assessment model; n=97) and Group B (patients receiving prophylactic treatment as per DOH VTE risk assessment; n=108). Data was collected over three months (From July 2022 to September 2022) and the patients were followed up on the third, seventh, fourteenth, and thirtieth day of their inpatient admission. Both Group A and Group B revealed that the majority of the patients (67% & 55%) were older individuals (60-80 years) and a large proportion of them required DVT prophylaxis. Both groups include patients with different diagnoses.

There is no published data available to cross-reference the results of observation for exactly comparing the Caprini RAM and DOH tools. But the study by Bilgi et al. reported that using an adapted Caprini scoring system helped assess the risk for VTE and recommendations to provide appropriate prophylaxis [11]. The study conducted by **Woolner et al.** concluded that implementing appropriate risk assessment for VTE prophylaxis according to NICE guidelines reduces the risk of unnecessary death [13].

According to the current study, Caprini RAM has the benefit of having a lot of risk factors, which may increase the sensitivity and specificity of risk stratification and therapy. Numerous risk factors for VTE are also present in the DOH tool, but their classification is more condensed, which could exaggerate the risk and result in needless prophylaxis. Individualising therapy is available in Caprini RAM, which aids in identifying individuals who are at low, moderate, and high risk and prevents needless prophylaxis.

The DOH form is applicable to all patients, whereas the Caprini risk assessment is only validated for use in elective post-operative patients. Even though both forms are labour intensive, completing the Caprini risk assessment (RAM) includes scoring and takes time, whilst completing the DOH tool is easier and doesn't involve scoring. Blood tests like Factor V Leiden, Prothrombin 202 10A, Lupus anticoagulant, anticardiolipin antibodies, and elevated serum homocysteine are required by Caprini RAM but are not included in the DOH tool because they are not necessary for all patients and are not cost-effective.

Comparison studies conducted by **Gatot et al.** on Wells score, Padua, and Caprini scores reported that Wells scores had better sensitivity, specificity, and accuracy than Caprini and Padua for diagnosing DVT [14]. Another study conducted by **Zhou et al.** on Padua and Caprini scores showed that the Caprini score is more effective and has a higher sensitivity to prevent the risk of VTE [15].

The risk assessment time and method have been concentrated on this comparison between numerical scoring and non-scoring forms, and the prophylactic therapy in accordance with the risk assessment model has been focused primarily in this study. When addressing certain aspects, Caprini risk assessment takes Intensivists some time in filling out the form and scoring them accordingly. If there is any wrong scoring there is a chance of change in the treatment, but Caprini is superior in its own way, it provides individualized treatment for the patients as per the numerical score.

The implementation of a simplified risk assessment tool like DOH risk assessment for VTE may not show any deviations like Caprini regarding the scores. It is user-friendly for the residents who fill out the forms. The Caprini RAM is a valid and reliable tool for risk assessment of VTE risk in surgically critically ill patients but the DOH tool is reliable for all critically ill patients which is according to the NICE guidelines.

This study shows increased compliance, after the VTE prophylaxis according to NICE guidelines has been brought into practice thus after the risk assessment the prescription of proper thromboprophylaxis has been administered to the patients when compared to Caprini RAM. But from both groups, there was no evidence of mortality, due to hospital acquired VTE.

A risk assessment tool, provider education, and audit-and-feedback interventions were combined in the literature that showed results of successfully increased VTE prophylaxis

rates. As a result, our study focused on two things; first, a multilayered strategy for the prevention of VTE, needs to be used in medical facilities that rely on residents to perform VTE prevention using individual risk assessments. Second, the accuracy of risk stratification and the appropriate prophylactic treatment for individual patients [16].

Limitation of the Study:

The study period was limited

None of the patients had any of the thrombophilia's parameters assessed, and none of the patients had any of the known risk factors (listed above) in the study group hence no information could be obtained about these relevant risk factors from the study population. As a result of this, the patient's risk level may be underestimated.

There was no incidence of PE and DVT in the present study, considering the rare occurrence of VTE; a study including a larger patient population may be required to estimate the incidence of VTE.

CONCLUSION:

The DOH tool is better than Caprini RAM to be used in hospitals, for risk assessment of VTE in both medical and surgical patients for accuracy and predictability of the prophylaxis. Although our study analyzed the impact of reminder alerts, audits, feedback, or instructional interventions, reducing variability in risk assessment and decision-making is an essential first step toward improving the quality of VTE prevention. Our findings in this endeavor are significantly different from those seen in other literatures.

ACKNOWLEDGEMENT:

We would like to expand our sincere thanks to all Intensivists, DMO's, and staff nurses in ICU, KMH who have directly and indirectly supported us in carrying out this research work and successfully completing it.

CONFLICT OF INTEREST

Authors declare no conflict of interest in the course of the current study.

REFERENCES:

1. Joseph T. DiPiro, Robert L. Talbert, Gary C. Yee, Gary R. Matzke, Barbara G. Wells, L. Michael Posey,2017, Pharmacotherapy A pathophysiological approach, McGraw-Hill Education/Medical, 125958643X, 9781259586439,2512.'

2. White RH. The epidemiology of venous thromboembolism. Circulation. 2003 Jun 17; 107(23_suppl_1):I-4. https://doi.org/10.1161/01.CIR.0000078468.11849.66

3. Venous thromboembolism (VTE), Centres for disease control and prevention, June 9 2022.

4. Pulmonary embolism, [INTERNET]. The Johns Hopkins University, The Johns Hopkins Hospital, and Johns Hopkins Health System, 2022. Available from: https://www.hopkinsmedicine.org/health/conditions-and-diseases/pulmonary-embolism

5. Heit JA. Epidemiology of venous thromboembolism. Nature Reviews Cardiology. 2015 Aug; 12(8):464-74. https://doi.org/10.1038/nrcardio.2015.83

PMid:26076949 PMCid:PMC4624298

6. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ. Trends in the incidence of deep vein thrombosis and pulmonary embolism: a 25-year population-based study. Archives of internal medicine. 1998 Mar 23; 158(6):585-93. https://doi.org/10.1001/archinte.158.6.585 PMid:9521222

7. Cushman M, Tsai AW, White RH, Heckbert SR, Rosamond WD, Enright P, Folsom AR. Deep vein thrombosis and pulmonary embolism in two cohorts: the longitudinal investigation of thromboembolism etiology. The American journal of medicine. 2004 Jul 1; 117(1):19-25. https://doi.org/10.1016/j.amjmed.2004.01.018 PMid:15210384

8. Ginsberg, J.S., et al., Postthrombotic syndrome after hip or knee arthroplasty: a crosssectional study. Arch Intern Med, 2000; 160(5):p. 669-72. https://doi.org/10.1001/archinte.160.5.669

9. Vish Bhattacharya, Gerard Stansby, Patrick Kesteven. Prevention and Management of Venous Thromboembolism. June 2015. World Scientific Publishing Co Pte Ltd. 264 https://doi.org/10.1142/p1010

10. Cronin M, Dengler N, Krauss ES, Segal A, Wei N, Daly M, Mota F, Caprini JA. Completion of the updated Caprini risk assessment model (2013 version). Clinical and Applied Thrombosis/Hemostasis. 2019 Apr 2; 25:1076029619838052. https://doi.org/10.1177/1076029619838052 PMid:30939900 PMCid:PMC6714938

11. Bilgi K, Muthusamy A, Subair M, Srinivasan S, Kumar A, Ravi R, Kumar R, Sureshkumar S, Mahalakshmy T, Kundra P, Kate V. Assessing the risk for development of venous thromboembolism (VTE) in surgical patients using adapted Caprini scoring system. International Journal of Surgery. 2016 Jun 1; 30:68-73. https://doi.org/10.1016/j.ijsu.2016.04.030 PMid:27109201

12. Catterick D, Hunt BJ. Impact of the national venous thromboembolism risk assessment tool in secondary care in England: retrospective population-based database study. Blood Coagulation & Fibrinolysis. 2014 Sep; 25(6):571. https://doi.org/10.1097/MBC.0000000000000100 PMid:24686103 PMCid:PMC4162339

13. Woolner B, Moore P, Parker S. 81 An Audit of Venous Thromboembolism (VTE) Risk Assessment & Prophylaxis Implementation. British Journal of Surgery. 2022 Mar; 109(Supplement_1):znac039-042. https://doi.org/10.1093/bjs/znac039.042

14. Gatot D, Mardia AI. Differences of wells scores accuracy, caprini scores and padua scores in deep vein thrombosis diagnosis. InIOP Conference Series: Earth and Environmental Science 2018; 125(1):012131. IOP Publishing. https://doi.org/10.1088/1755-1315/125/1/012131

15. Zhou H, Hu Y, Li X, Wang L, Wang M, Xiao J, Yi Q. Assessment of the risk of venous thromboembolism in medical inpatients using the Padua prediction score and Caprini risk assessment model. Journal of atherosclerosis and thrombosis. 2018:43653. https://doi.org/10.5551/jat.43653 PMid:29540637 PMCid:PMC6224205

16. Beck MJ, Haidet P, Todoric K, Lehman E, Sciamanna C. Reliability of a point-based VTE risk assessment tool in the hands of medical residents. Journal of hospital medicine. 2011 Apr; 6(4):195-201. https://doi.org/10.1002/jhm.860 PMid:21480490