Stratification of venous thromboembolism risk in orthopedic traumas patients

Estratificação do risco de tromboembolismo venoso em pacientes vítimas de traumas ortopédicos

Estratificación del riesgo de tromboembolismo venoso en pacientes con traumas ortopédicos

Ana Caroliny da Silva[I] ; Lais Lara Silva Xavier[I] ; Thainara Lorraine Costa e Silva Pereira[I] ;
Deborah Camargo[I] ; Thais Vilela de Sousa[II] ; Lorena Morena Rosa Melchior[I]

[I]Secretaria de Estado de Saúde de Goiás, Goiânia, Brazil; [II]Universidade Federal de Goiás, Goiânia, Brazil

ABSTRACT
Objective: to identify stratification of venous thromboembolism risk in orthopedic trauma patients. **Method:** in this quantitative, descriptive, cross-sectional study, data were collected from March to August 2021 and risk of venous thromboembolism based on the Padua and Caprini scales. **Results:** the study sample of 216, mostly male, patients were of median age 37 years. The patients were classified, by severity, as 60.19% emergency care and motorcycle accidents were the most frequent type. Leg and thigh were the region most affected by trauma and the main determinants for raising the scale were described. **Conclusion:** venous thromboembolism is an event amenable to preventive attention and care. Risk stratification assessment should thus be performed for all orthopedic trauma patients.
Descriptors: Venous Thromboembolism; Risk Measurement; Risk Factor.

RESUMO
Objetivo: identificar a estratificação de risco para tromboembolismo venoso em pacientes de traumas ortopédicos. **Método:** estudo de abordagem quantitativa, descritivo, do tipo transversal, com dados coletados de março a agosto de 2021 e risco de tromboembolismo venoso baseado na escala de Pádua e na escala de Caprini. **Resultados:** a amostra do estudo foi de 216 pacientes, composta pela maioria do sexo masculino, com a mediana de idade de 37 anos. Em relação a gravidade do paciente, 60,19% foram classificados como atendimento de urgência e o tipo de acidente mais frequente foi o motociclístico. A região mais acometida em decorrência do trauma foi a perna e a coxa, sendo descritos os principais determinantes para a elevação da escala. **Conclusão:** o tromboembolismo venoso é um evento passível de atenção e cuidados para a prevenção. Por isso, a avaliação para estratificação de risco deve ser realizada para todos os pacientes vítimas de traumas ortopédicos.
Descritores: Tromboembolismo Venoso; Medição de Risco; Fatores de Risco.

RESUMEN
Objetivo: identificar la estratificación del riesgo de tromboembolismo venoso en pacientes de traumas ortopédicos. **Método:** estudio de enfoque cuantitativo, descriptivo, transversal, con datos recolectados de marzo a agosto de 2021 y riesgo de tromboembolismo venoso con base en la escala de Padua y la escala de Caprini. **Resultados:** la muestra del estudio estuvo constituida por 216 pacientes, en su mayoría del sexo masculino, con un promedio de edad de 37 años. En cuanto a la gravedad del paciente, el 60,19% se clasificó como atención de urgencia y el tipo de accidente más frecuente fue el de motocicleta. La región más afectada a consecuencia del traumatismo fue la pierna y el muslo, y se describieron los principales determinantes para la elevación de la escala. **Conclusión:** el tromboembolismo venoso es un evento que requiere atención y cuidados para su prevención. Por lo tanto, se debe realizar una evaluación de la estratificación del riesgo para todos los pacientes víctimas de traumas ortopédicos.
Descriptores: Tromboembolismo Venoso; Medición de Riesgo; Factores de riesgo.

INTRODUCTION

Venous thromboembolism (VTE) is a complication in patients' victims of trauma it is the most frequent cause of preventable death during hospitalization[1,2]. The VTE covers two related diseases, Deep vein thrombosis (DVT) and Pulmonary Embolism (PE)[3,4].

The DVT results from the formation of a thrombus in deep veins, it occurs mainly in lower members, the clinical findings include pain or asymmetrical and unilateral edema. The highest clinical significance of DVP is due to its direct risk relation to PE[1,5]. PE is the obstruction of the pulmonary artery or its branches by the impaction of one or more embolus, with consequential cardiorespiratory events. The physiopathology of this grievance is described by Virchow's triad, which includes endothelial injury, blood stasis, and hypercoagulability[1,5].

According to the 2020 American Society of Hematology guidelines, VTE occurs in one to two per 1,000 individuals per year or 300,000 to 600,000 events in the United States annually. The incidence increases with age, varying from one to every 10,000 individuals less than 20 years old to one to every 100 individuals 80 years old or older[6]. Hospitalized

---

Research Article
Artigo de Pesquisa
Artículo de Investigación

patients have at least one risk factor for VTE and about 40% have three or more, besides it presents itself asymptomatic in up to 70% of the cases[7,8]. The mortality after 30 days reaches 25%. Among the individuals that survive, 30% have a high risk of developing DVT, recurrent within ten years, besides significantly increasing the time of hospitalization[9,10].

The thrombosis may affect up to 58 patients that suffered serious traumas[11]. That occurs by the impact of blood vessels as well as by the time the person stays immobilized in bed after the accident. Due to the high incidence and prevalence of hospitalizations in health services regarding traumas and their direct relation as a risk factor for VTE, it becomes a concerning reality and with the necessity of studies[12,13].

Therefore, preventing VTE in hospitalized people must be one of the priorities of the health team, and prophylactic measures must be employed according to the identified risk[9,10,14]. Currently, there are different protocols of stratifications created with the aim of the classification of these patients based on health records, risk factors, hospitalization cause, immobilization, and type of surgery[10,12,13].

In the hospital environment, the nurse team constantly faces patients diagnosed with VTE, being important that these professionals know and apply stratification protocols and prevention measures, thus, identifying the main determinants of traumatized patients that increase the risk of VTE besides the trauma itself becomes the research object of this study.

Based on this context, this study aims to identify the risk stratification for venous thromboembolism in patients with orthopedic traumas.

METHODS

This is a study with the qualitative, descriptive, and cross-sectional study carried out in a large hospital that provides high and medium complexity assistance in urgency and emergency, with a focus on traumatology.

We defined the population as hospitalized patients in care units, both sex, older than 18 years old, and victims of orthopedic traumas. We excluded older patients (>60 years old) in the Intensive Care Unit (ICU) and patients transferred from the ICU to the care unit.

We carried out a sample size calculation, in which we considered the finite population of 2153 (number of orthopedic traumas in the institution in 2020), with a prevalence of 50%, sampling error of 5%, and level of confidence of 95%. Hence, the sample size calculated was 180 patients, in which we add 20% of coverage of possible loss and inconsistencies, totalizing 216 patients as the final sample of the study.

To guarantee the sample, we randomly carried out the data collection in March and August of 2021. We collected the data through interviews with the patients and the daily analysis of the medical records by the evaluations of the medical and nurse evolutions and the Padua and Caorini daily score until the finalization of the case (patient discharge, death, and transfer). We considered the time of 72 hours after the hospitalization to approach the patients and to carry out the interview. We measured the risk stratification for VTE by two models of risk assessment, the Padua score for the risk stratification of clinical patients and the Caprini score for surgical patients.

We generated Padua's prediction score by the division of intern medicine of the University of Padua (Italy) in 2010, integrating the *Kucher* model with the additional items and lightly modified scores aiming to allow the identification of all the conditions to which the international guidelines strongly recommend the thromboprophylaxis. The Padua score analyzes 11 characteristics of the patient, totalizing a maximum score of 21 points the higher the score, the higher the risk, being the score < 4 configuring low risk and $\geq$ 4 high risk[12,15].

The protocol developed by Joseph A. Caprini uses the hybrid approach with guidelines based on evidence and consensus statements that analyzes 38 variables able to reach a maximum score of 82 points and will classify the patients as low (1-2 points), moderate (3-4 points) or high risk ($\geq$ 5 points)[13].

We oriented the interview with an instrument of data collection, structured, developed by the researcher containing the evaluation of the level of risk for VTE (based on scales), and the independent variables adopted were: sociodemographic (sex, age, marital status, race, religion, educational level (in years), provenance); clinical (chronic disease, smoking habits, drinking habits, exercise habits, weight, height, Body Mass Index (BMI), admission and discharge date, time of hospitalization); trauma characteristics (patient severity, type of accident, affected region, classification of the affected bones); interventions carried out (usage of plastered splint, external fasteners, and skeletal traction); prophylaxis carried out (early ambulation and drug thromboprophylaxis).

For the data presentation, we carried out a simple descriptive analysis explicit by absolute and relative frequencies and medium and standard deviation.

The research followed the norms and guidelines that regulate research involving human beings and the determinations contained in Resolution 466/2012 of the National Health Council. The Research Ethics Committee of the institution approved the research protocol. All study participants signed the Free and Informed Consent (IC).

RESULTS

We excluded the data from 216 patients' victims of orthopedic trauma, presented in Table 1.

TABLE 1: Distribution of orthopedic trauma cases, according to the sociodemographic characteristics and previous clinical conditions (n=216). Goiânia, GO, Brazil, 2021.

Variables	n (%)
Sex	
Male	170 (78.70)
Female	46 (21.30)
Marital status	
Single	119 (55.09)
Married	86 (39.81)
Others	11 (5.10)
Race	
White	54 (25.00)
Non-white	162 (75.00)
Religion	
Catholic	102 (47.22)
Evangelical	55 (25.46)
Others	59 (27.32)
Chronic disease	
Yes	28 (12.96)
No	188 (87.04)
Smoking habits	
Yes	60 (27.78)
No	128 (59.26)
Ex smoker	28 (12.96)
Drinking habits	
Yes	105 (48.61)
No	111 (51.39)
Exercise habits	
Yes	38 (17.59)
No	178 (82.41)
Age (years)	Median=37; IQR: 27-47
Weight (kilos)	Median=75; IQR: 65-86
Height (metre)	Median=1,71; IQR: 1,65-1,77
BMI (kg/m^2)	Median=25,31; IQR: 22,74-28,94

IQR: interquartile range

The majority of the sample was male 170 (78.70%), with an age median of 37 years old, single 119 (55.09%), that declared as non-white 162 (75.00%), and from catholic religion 102 (47.22%).

Regarding the clinical conditions and life habits of participants of this research, 28 (12.96%) presented chronic disease, 178 (82.41%) did not exercise, 60 (27.78%) were smokers, and 105 (48.61%) were alcoholics. The median weight was 75 kg, the height was 1.71m, and the Body Mass Index (BMI) was 25.31.

In Table 2, we present the date regarding the characteristics of traumas and hospitalization.

TABLE 2: Distribution of cases according to the characteristics of trauma and hospitalization (n=216). Goiânia, GO, Brazil, 2021.

Variables	n (%)
Patient severity on admission	
1 - Red	3 (1.39)
2 - Orange	63 (29.17)
3 - Yellow	130 (60.19)
4 - Green	20 (9.26)
Type of accident	
1 - Motorcycle	126 (58.33)
2 - Fall from height	28 (12.96)
3 - Work accident	22 (10.19)
4 - Traffic collision	18 (8.33)
5 - Pedestrian Running Over	9 (4.17)
6 - White weapon injury	5 (2.31)
7 - Others	8 (3.70)
Affected region	
1 - Leg	36 (16.67)
2 - Thigh	34 (15.74)
3 - Hand	24 (11.11)
4 - Foot	21 (9.72)
5 - Forearm	18 (8.33)
6 - Spine	16 (7.41)
7 - Arm	11 (5.09)
8 - Pelvis	10 (4.63)
9 - Shoulder	8 (3.70)
10 - More than one affected region	38 (17.56)
Classification of the affected bones	
1 - Long	100 (46.30)
2 - Short	20 (9.26)
3 - Irregular	16 (7.41)
4 - Sesamoid	5 (2.31)
5 - Elongated	4 (1.85)
6 - Flat (laminar)	1 (0.46)
7 - More than one affected bone	70 (32.41)
Days of hospitalization	Median=7; IQR: 6-11

IQR: interquartile range

Regarding the severity of the patient, we classified 130 (60.19%) as urgent care in the admission, and the most frequent type of accident was motorcycle 126 (58.33%). The most affected region due to trauma was the leg and thigh, 36 (16.67%) and 34 (15.74%), respectively. The long bones were the ones that had the most fractures in 100 (46.30%) patients regarding the time of hospitalization, the median was seven days.

In Table 3, we present the main determinants for the increase of Padua and Caprini's scores in traumatized patients.

TABLE 3: Main determinants for the increase of scales (n=216). Goiânia, GO, Brazil, 2021.

Variables	n	f (%)
Padua score (n=36)		
1 - Trauma ou recent surgery (last month)	32	88.89
2 - Reduced mobility >72 horas	9	25.00
3 - Known thrombophilia	2	5.56
4 - Infections and/or rheumatologic diseases	1	2.78
Caprini Score (n=180)		
1 - Minor surgery	105	58.66
2 - Bed restriction (>72h)	68	37.99
3 - Age 41-60	58	32.40
4 - Major surgery (>45 min)	48	26.82
5 - Lower limb edema	35	19.55
6 - Polytrauma	26	14.53
7 - Bed restriction	18	10.06
8 – Knee and hip arthroplasty	5	2.79
9 - Plaster immobilization	5	2.79
10 - Major surgery (< 1 month)	4	2.23
11 - Hip/Pelvis Fracture	4	2.23
12 - Obesity > 150 kg	3	1.68
13 - Spinal cord trauma	3	1.68
14 - Arthroscopy	2	1.12
15 - Central venous catheter	2	1.12

Regarding the risk of VTE, in 36 (16.6%) patients, we carried out the stratification based on Padua score and 180 (83.4%) on Caprini score. From the 36 stratified with Padua score, 28 patients presented low risk and 8 high risks, and from the 180 stratified with the Caprini score, 91 presented a low risk, 39 were moderate, and 50 patients were high risk.

We present the VTE risk stratification in Table 4.

TABLE 4: Stratification risk of VTE (n=216). Goiânia, GO, Brazil, 2021.

Variables	Padua score				Caprini score					
	Low risk 28 (77.78)		High risk 8 (22.22)		Low risk 91 (50.56)		Moderate risk 39 (21.67)		High risk 50 (27.78)	
	n	%	n	%	n	%	n	%	n	%
Plaster splint										
1 - Yes	16	57.14	6	75.00	74	81.30	28	71.79	38	76.00
2 - No	12	42.86	2	25.00	17	18.70	11	28.21	12	24.00
External fasteners										
1 - Yes	10	35.71	5	62.50	68	74.70	28	71.79	39	78.00
2 - No	18	64.29	3	37.50	23	25.30	11	28.21	11	22.00
Skeletal traction										
1 - Yes	0	0.00	0	0.00	2	2.20	4	10.26	2	4.00
2 - No	28	100.00	8	100.00	89	97.80	35	89.74	48	96.00
Early ambulation										
1 - Yes	22	78.57	0	0.00	51	56.00	11	28.21	8	16.00
2 - No	6	21.43	8	100.00	40	44.00	28	71.79	42	84.00
Drug thromboprophylaxis										
1 - Yes	8	28.57	6	75.00	46	50.60	29	74.36	46	92.00
2 – No	20	71.43	2	25.00	45	49.50	10	25.64	4	8.00

Of the 216 participants in the sample, 162 were using plaster splints and 150 external fasteners, and 8 were using skeletal traction, some patients received more than one intervention of immobilization. Those who used plaster splints and external fasteners 44 and 39 presented a high risk for VTE, respectively.

Regarding the interventions carried out in the prevention of VTE, we analyzed two variables, early ambulation, and drug thromboprophylaxis. We carried out the early ambulation in 92 (42.59%) of the patients with orthopedic trauma, and drug thromboprophylaxis carried out in 135 (62.50%) of the total sample, and the medicine used in all the cases was the low molecular weight heparin, injectable solution 40 mg/5000 IU, once a day.

DISCUSSION

The majority of the sample was male, with a median age of 37 years old, and single. A similar result to another research in which the median was 39.88 years old and the majority of the sample 71.60% was male patients[16].

Given the presented data, we can observe that young adults suffer more trauma, which can be justified due to the lifestyle and cultural process that they are inserted. Since the release of the National Men's Health Policy in 2009, Brazil's Health Ministry was signaling that given the brutality associated with men, the higher use of alcoholic drinks, the drug use, and the greater access to weapons, they were more inclined to suffer traumas[17,18].

Regarding the gravity of these patients, we classified 60.19% as urgent care in the admission, which configuration as moderate gravity, We found similar results in a study carried out in India in 2016, in which the screening priority distribution was: priority one (15.5%), priority two (56%), and priority three (28.5%)[19,20].

In this study, the most frequent accident was the motorcycle in 58.33%. The most affected region due to trauma was the leg and thigh, corroborating with a cross-sectional study carried out on 1148 patients. Regarding the type of accident, one of the justifications includes the fact that the institution of the study is a large hospital that provides high and medium complexity assistance in urgency and emergency, focusing on traumatology, being the main reason for this patient profile in the network[16].

Concerning the affected region due to trauma, we observed that the majority of musculoskeletal traumas in members could be justified because these parts of the body are more exposed, which provides a higher number of traumas. This category of trauma is more unfavorable because the recovery time is long, it has a high rate of lethality, and the majority of the time leaves sequels that prevent individuals from returning to their work activitiess[21,22,23].

These patients, during the process of hospitalization, present a risk of VTE given the presence of acquired or hereditary factors. The main determinants for the increase of Padua and Caprini scales in a traumatic patient found in this study are, respectively, Padua: trauma or recent surgery (last month), reduced mobility >75 hours, and known thrombophilia. In the Caprini evaluation, we found: minor surgery, bed restriction (>72h), age 41-60, major surgery (>45 min), Lower limb edema, polytrauma, bed restriction, knee and hip arthroplasty.

In a cross-sectional and descriptive study carried out in a large hospital from the interior of São Paulo state, which analyzed 592 patients, we observed that the main determinants for the increase of Padua scale were: reduced mobility, recent trauma or surgery (last month's), known thrombophilia, and for the Caprini scale: major surgery, minor surgery, age from 41 to 61 years old, knee and hip arthroplasty and polytrauma[1].

Both studies are similar regarding the characteristics found, demonstrating that Padua and Caprini scores revealed themselves to be useful and easy to utilize once they check scores for different risk factors and assist in the comprehension that patients with the same number of factors can be stratified in different levels of risk for VTE. That will provide an expressive group of patients to benefit from chemoprophylaxis once the stratification of patients in risk categories is a tool considered more adequate to the decision-making regarding the prophylactic measure to be adopted[1].

The loss of mobility, recent or continuous, is a common risk factor acquired and important for the development of VTE, increasing its incidence by two to five times when compared with the incidence of patients with normal ambulation. Other studies[24,25] suggested this is due to the trauma and its relation between reduced mobility and risk increase for VTE, proportional to the level and the time of bed restriction.

Although the importance of immobilization as a risk factor for the development of VTE has already been defined in the literature, there is still no consensus on the definition of immobilization. Randomized clinical studies highlight the high heterogeneity in the characterization of immobility applied to hospitalized patients. Among the suggested definitions, we highlight: expected immobilization for more than half of a day in 7 days, bed confinement for more than 2/3 of each day for 10±2 days, bed confinement > 4 days, projected hospitalization for ≥ 4 days and ≤ 3 days of

immobilization before the hospitalization, absolute or sedentary rest with no access to the restroom and inability to achieve an autonomous walking distance > 10 meters in 10±4 days[25]. Regarding the carried-out intervention for the prevention of VTE, we analyzed two variables, early ambulation, and drug thromboprophylaxis. We observed that mechanical prophylaxis is less prescribed and utilized. Prevention has already been highlighted as fundamental and necessary to avoid acute complications, such as PE, or chronic, such as post-thrombotic syndrome. With the evidence reported in the literature, the measures of prophylaxis are even more discussed and indicated with the protocol enhancement[14,26,27].

The lack of knowledge about the preventive measures and protocols of classification regarding the risk of VTE may be the reason for the non-utilization of non-pharmacological measures of prevention[14]. Considering that the nurse is the professional who continuously and uninterruptedly assists hospitalized patients, he/she has a fundamental role in the identification of the risk for VTE and the implementation of prophylactic interventionss[26,27].

Several studies[14,26,27] discuss the role of the nurse in a section of the Nursing Interventions Classification (NIC) taxonomy. Hence, we present subsequently the non-pharmacological interventions that can be implemented with the patient with risk for VTE: Having the patient's detailed medical records aiming to determine their risk factors; Carry out the evaluation and risk stratification for VTE in hospitalized patients; Stimulate the secure ambulation; elevate 20° any member supposedly affected or above the level of the heart to, then, increase the venous return; indicate, implement the use of elastic graduated compression stockings; Carry out the risk stratification for VTE; Daily evaluate the skin colocation, peripheral perfusion of members receiving compressive treatment, evaluate the level of comfort with use and guarantee the adequate comprehension; in case of edema formation, the member must be measured again and the stocks adjusted; encourage patients the use of stoking during the day and the night till their mobility are not significantly reduced; teach and supervise the patient during exercises of dorsiflexion and plantar flexion, followed by medial and lateral rotation of the foot, 10 repetitions to every hour, till total ambulation of the post-surgical patient; Teach hospitalized patients about VTE, preventive measures and diseases complication.

The nurse must then have as a routine the evaluation of these patients guided by the institutional protocols, furthermore, the measures of prevention must be implemented as initiatives lined with evidence, supported by protocols, and without waiting for the prescription of another professional. Regarding the pharmacological measures, the nurse must double-check.

Limitations of the study

This study has its limitations in its methodological design, which does not enable monitoring of the population and the outcome analysis, another point we highlight is that the population was underrepresented because we excluded ICU patients given the degree of gravity and impossibility of signing the consent form.

However, besides having statistical power assured by its sample size calculation and sample reached, it enables a better understanding of the reality of the traumatological health in the investigated region. These data also provided a wide discussion regarding the theme once the present results of this study add to the literature and constitute evidence and subsidies for more assertive and effective public policies.

CONCLUSION

Venous thromboembolism is an event liable to attention and care for prevention. Thus, the evaluation for risk stratification must be carried out on every patient victim of orthopedic trauma, and mechanical prophylaxis must be instituted for patients in specific conditions associated with pharmacological prophylaxis.

However, non-pharmacological prophylaxis is a secure and viable therapy that may avoid the deleterious effects of prolonged immobilization in bed, presenting positive answers to the hospitalized patient.

We highlight that these measures are still not fully utilized, some of the possible explanations for the underspend are: the lack of routine in health services on applying prophylaxis measures in their patients that occasionally contributes to the low percentage of prophylaxis in venous thromboembolism.

We conclude that the risk stratification must be carried out as a routine, and the prophylaxis measures must be implemented considering that the prevention forms are superior to the treatment; hence, we suggest strengthening educational programs.

REFERENCES

1. Farhat FCLG, Gregório HCT, Carvalho RDP. Evaluation of deep vein thrombosis prophylaxis in a general hospital. J Vasc Bras. 2018 [cited 2020 Nov 04]; 17(3):184-92. DOI: https://doi.org/10.1590/1677-5449.007017.

2. Tajik F, Wang M, Zhang X, Han J. Evaluation of the impact of body mass index on venous thromboembolism risk factors. PLoS ONE. 2020 [cited 2020 Nov 04]; 15(7):e0235007. DOI: https://doi.org/10.1371/journal.pone.0235007.

3. Du Plessis JA, Van Blydenstein SA, Wong M. Evaluation of the use of low-molecular-weight heparin for venous thromboembolism prophylaxis in medical patients. S Afr Med J. 2020 [cited 2020 Nov 04]; 110(3):235-42. DOI: https://doi.org/10.7196/SAMJ.2020.v110i3.14279.

4. Raymundo SRO, Lobo SMA, Hussain KMK, Hussein KG, Secches IT. What has changed in venous thromboembolism prophylaxis for hospitalized patients over recent decades: review article. J Vasc Bras. 2019 [cited 2020 Nov 04]; 18:227-31. DOI https://doi.org/10.1590/1677-5449.002118.

5. Neto RAB. Trombose venosa profunda. In: VELASCO, I. T et al. Medicina de Emergência: Abordagem Prática. 14. ed. rev. [S. l.], 2020. cap. 44, p. 547.

6. Ortel TL, Neumann I, Ageno W, Beyth R, Clark NP, Cuker A, et al. American Society of Hematology 2020 guidelines for management of venous thromboembolism: treatment of deep vein thrombosis and pulmonary embolism. Blood Adv. 2020 [cited 2020 Nov 06]; 4(19):4693-738. DOI: https://doi.org/10.1182/bloodadvances.2020001830.

7. Kearon C, Akl EA, Ornelas J, Blaivas A, Jimenez D, Bounameaux H, et al. Antithrombotic therapy for VTE disease CHEST Guideline and Expert Panel Report. Chest. 2016 [cited 2020 Nov 04]; 149(2):315-52. DOI: https://doi.org/10.1016/j.chest.2015.11.026.

8. Silva MAM, Figueiredo MV, Carmo MH, Rezende PRL, Grigório TS, Jesus-Silva SG, Krupa AE, Cardoso RS. Impact of a venous thromboembolism prophylaxis protocol on the quality of medical prescriptions. Rev. Ciências em Saúde. 2019 [cited 2020 Nov 24]; 9(2):1-9. DOI: https://doi.org/10.21876/rcshci.v9i1.853.

9. SBACV. Diretrizes da Sociedade Brasileira de Angiologia e Cirurgia Vascular Trombose Venosa Profunda Diagnóstico e Tratamento, 2015.

10. Silva JS, Lee J, Grisante DL, Lopes JL, Lopes CT. Nurses' knowledge, risk assessment, and self-effi cacy regarding venous thromboembolism. Acta Paul Enferm. 2020 [cited 2020 Nov 4]; 33(1):eAPE20190125. DOI: http://dx.doi.org/10.37689/acta-ape/2020AO0125.

11. Zhou Y, Xu Z, Liao J, Feng F, Men L, Xi L, He Y, Li G. New standardized nursing cooperation workflow to reduce stroke thrombolysis delays in patients with acute ischemic stroke. Neuropsychiatr Dis Treat. 2017 [cited 2020 Nov 06]; 13:1215-20. DOI: https://doi.org/10.2147/NDT.S128740.

12. Barbar S, Noventa F, Rossetto V, Ferrari A, Brandolin B, Perlati M, De Bon E, Tormene D, Pagnan A, Prandoni P. A risk assessment model for the identification of hospitalized medical patients at risk for venous thromboembolism: the Padua Prediction Score. J Thromb Haemost. 2010 [cited 2020 Nov 06]; 8(11):2450-7. DOI: https://doi.org/10.1111/j.1538-7836.2010.04044.x.

13. Caprini JA. Thrombosis risk assessment as a guide to quality patient care. Dis Mon. 2005 [cited 2020 Nov 04]; 51(2-3):70-8. DOI: https://doi.org/10.1016/j.disamonth.2005.02.003.

14. Pereira NT. A frequência do uso de profilaxia mecânica em paciente com trombose venosa profunda: uma revisão integrativa de literatura. Centro Universitário CESMAC. 2020; 14(1):1-19. Available from: https://doity.com.br/anais/cies2021/trabalho/177042.

15. Kucher N, Koo S, Quiroz R, Cooper JM, Paterno MD, Soukonnikov B, et al. Electronic alerts to prevent venous thromboembolism among hospitalized patients. N Engl J Med. 2005 [cited 2020 Oct 07]; 352(10):969-77. DOI: https://doi.org/10.1056/nejmoa041533.

16. Paulo GML, Colares CMP, Margarida MCA, Silva AR, Silva AC, Xavier LLS, et al. Trauma: socio - demographic characteristics of the victims and clinical care aspects of their occurrence in an emergency hospital. REAS. 2021 [cited 2020 Nov 04]; 13(10):1-10. DOI: https://doi.org/10.25248/REAS.e8683.2021.

17. Ministério da Saúde (Br). Política Nacional de Atenção Integral à Saúde do Homem: princípios e diretrizes; Secretaria de Atenção à Saúde, Departamento de Ações Programáticas e Estratégicas. Brasília (DF): Ministério da Saúde; 2009a.

18. Alves RA, Pinto LMN, Silveira AM, Oliveira GL, Melo EM. Men, victims and perpetrators of violence: the corrosion of public space and the loss of the human condition. Interface - Comunic., Saúde, Educ. 2012 [cited 2020 Nov 06]; 16(43):871-83. DOI: https://doi.org/10.1590/S1414-32832012005000049.

19. Mackway-Jones K, Marsden J, Windle J. Sistema Manchester de Classificação de Risco. 2. ed. Belo Horizonte: Folium, 2018. 207 p. ISBN 978-85-8450-013-0.

20. Abhilash KP, Chakraborthy N, Pandian GR, Dhanawade VS, Bhanu TK, Priya K. Profile of trauma patients in the emergency department of a tertiary care hospital in South India. J Family Med Prim Care. 2016 [cited 2020 Nov 06]; 5(3):558-63. DOI: https://doi.org/10.4103/2249-4863.197279.

21. Silva LAP, Ferreira AC, Paulino RES, Guedes GO, Cunha MEB, Peixoto VTCP, Faria TA. Retrospective analysis of the prevalence and epidemiological profile of trauma patients in a secondary hospital. Rev Med. 2017 [cited 2020 Nov 06]; 96:4. DOI: https://doi.org/10.11606/issn.1679-9836.v96i4p245-253.

22. Augusto VG, Amaral FMFR, Fernandes ACFR, Tavares PA, Castro KCF, Lopes MMP. Disability of workers with upper limb musculoskeletal injuries in a rehabilitation center. REFACS. 2018 [cited 2020 Nov 06]; 6(Supl. 2):563-70. DOI: https://doi.org/10.18554/refacs.v6i0.3126.

23. Damasceno IS, Alves TM, Santos LRO, Fianco MC, Nilkece S, Araújo M, Silva MNL. Characterization clinical and epidemiological of victims of motorcyclical accidents. Enferm em Foco. 2018 [cited 2020 Nov 06]; 9(2):13-7. DOI: https://doi.org/10.21675/2357-707X.2018.v9.n2.1131.

24. Chindamo MC, Marques MA. Role of ambulation to prevent venous thromboembolism in medical patients: where do we stand? J Vasc Bras. 2019 [cited 2020 Nov 06]; 18(1):e20180107. DOI: https://doi.org/10.1590/1677-5449.180107.

25. Ye F, Bell LN, Mazza J, Lee A, Yale SH. Variation in definitions of immobility in pharmacological thromboprophylaxis clinical trials in medical inpatients: a systematic review. Clin Appl Thromb Hemost. 2018 [cited 2020 Nov 06]; 24(1):13-21. http://dx.doi.org/10.1177/1076029616677802.

26. Barp M, Carneiro VSM, Amaral KVA, Pagotto V, Malaquias SG. Nursing care in the prevention of venous thromboembolism: an integrative review. Rev. Eletr. Enferm. 2018 20:20a14. DOI: https://doi.org/10.5216/ree.v20.48735.

27. Gomes ET, Assunção MCT, Lins EM, Püschel VAA. Nursing in mechanical prevention of venous thromboembolism in surgical patients. Rev Esc Enferm USP. 2021[cited 2020 Nov 06]; 55:e03738. https://doi.org/10.1590/S1980-220X2020002703738.

28. Classificação das intervenções de enfermagem (NIC) / editores Howard K. Butcher ... [et al.]; tradução Vilma Ribeiro de Souza Varga, Denise Costa Rodrigues. – 7. ed. – Rio de Janeiro: GEN | Grupo Editorial Nacional S.A. Publicado pelo selo Editora Guanabara Koogan Ltda., 2020. ISBN 978-85-9515-7613.