

Deep venous thrombosis prophylaxis: practical application and theoretical knowledge in a general hospital

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ABSTRACT

Background: Although this work belongs to the area of vascular surgery, it is relevant to all clinical and surgical specialties due to the clinical importance of deep venous thrombosis and its main complication, pulmonary embolism.

Objectives: To verify whether pharmacological prophylaxis of deep venous thrombosis is being adequately and routinely used in our service and to evaluate physicians' knowledge about the indications of deep venous thrombosis chemoprophylaxis.

Methods: A prospective study was accomplished including 850 patients hospitalized from March to May 2007 at Hospital Geral de Roraima. Clinical, pharmacological and surgical factors were researched. Risk stratification and evaluation of prophylaxis were established according to the classification suggested by the Brazilian Society of Angiology and Vascular Surgery and to the protocol developed by Caiafa in 2002. Physicians answered a questionnaire and analyzed three hypothetical clinical cases. Data were tabled and statistically analyzed with the support of the software Epi-Info 2002®.

Results: Of the 850 patients surveyed, 557 (66.66%) were clinical and 293 (33.34%) were surgical patients. Of the total, 353 (41.56%) had low risk, 411 (48.32%) medium risk and 86 (10.12%) high risk for development of deep venous thrombosis. Of the 497 patients that needed to receive chemoprophylaxis for deep venous thrombosis, only 120 (24%) received it and of these, 102 (85%) received it adequately. Any patient who did not need prophylaxis received it. Clinical physicians prescribed prophylaxis more frequently and correctly than surgeons, although the latter have demonstrated better theoretical knowledge of the theme. In general, theoretical knowledge on deep venous thrombosis was insufficient.

Conclusions: In our hospital, chemoprophylaxis for deep venous thrombosis is underused in patients indicated for receiving it. Therefore, it is necessary to implement a continuous education program about this theme.

Keywords: Thromboembolism, deep venous thrombosis, risk factors, prophylaxis.

RESUMO

Contexto: Trabalho realizado na área de cirurgia vascular, porém relevante a todas as especialidades clínicas e cirúrgicas devido à importância clínica da trombose venosa profunda e sua principal complicação, a embolia pulmonar.

Objetivos: Verificar se a profilaxia para a trombose venosa profunda está sendo utilizada de forma adequada e rotineira em nosso serviço e avaliar o conhecimento dos médicos sobre as indicações de profilaxia medicamentosa.

Métodos: Foi realizado um estudo prospectivo com 850 pacientes internados de março a maio de 2007 no Hospital Geral de Roraima. Foram pesquisados fatores clínicos, medicamentosos e cirúrgicos. A estratificação de risco e a avaliação da profilaxia foram estabelecidas conforme a classificação recomendada pela Sociedade Brasileira de Angiologia e Cirurgia Vascular e o protocolo realizado por Caiafa em 2002. Os médicos responderam a um questionário e analisaram três casos clínicos hipotéticos. Os dados foram tabulados e analisados estatisticamente usando o programa de computador Epi-Info 2002®.

Resultados: Dos 850 pacientes estudados, 557 (66,66%) eram clínicos e 293 (33,34%) cirúrgicos. Do total, 353 pacientes (41,56%) foram classificados como baixo risco, 411 (48,32%) como médio risco e 86 (10,12%) como alto risco para desenvolver trombose venosa profunda. Dos 497 pacientes que necessitavam receber profilaxia medicamentosa para trombose venosa profunda, apenas 120 (24%) a receberam; destes, 102 (85%) a receberam de forma correta. Dos que não necessitavam de profilaxia, nenhum a recebeu. Os clínicos prescreveram mais e de forma mais correta a profilaxia em relação aos cirurgiões, apesar de estes terem demonstrado possuir um melhor conhecimento teórico do tema. No geral, o conhecimento teórico sobre trombose venosa profunda foi insuficiente.

Conclusões: Em nosso serviço, a profilaxia medicamentosa da trombose venosa profunda é subutilizada em pacientes com indicação para recebê-la, tornando necessária a implementação de um programa de educação continuada sobre o tema.

Palavras-chave: Tromboembolismo, trombose venosa profunda, fatores de risco, profilaxia.

Introduction

The origin of deep venous thrombosis (DVT) can be analyzed based on Virchow's triad, described in 1856. Stasis, endothelial lesion and hypercoagulability, combined or alone, are factors associated with its etiopathogenic genesis.¹

DVT, which has multidisciplinary occurrence, is a frequent and severe entity, mainly resulting from other surgical or clinical affections. Its most severe complications are acute pulmonary embolism (PE) and late postthrombotic syndrome.²

DVT and PE are also major public health problems, especially in the elderly. Whereas incidence of PE has been through a slight decrease in recent decades, incidence of DVT remains unchanged for men and is increasing in older women.³ In a review study using meta-analysis, worldwide incidence of DVT was estimated in 50 cases per 100,000 inhabitants/year. Its incidence is slightly higher in women compared to men, drastically increasing with age, from 20-30 cases per 100,000 people/year in the age group 30-49 years for 200 cases per 100,000 people/year in the age group 70-79 years.⁴ In Western countries, incidence is estimated in 48 cases of DVT and 23 cases of PE per year for each 100,000 inhabitants.⁵

In necropsy-based studies, thromboembolism was the most common cause of preventable hospital mortality and morbidity and mortality in surgical patients, and also accounted for 300,000-600,000 hospitalizations a year.⁶ When fatal, death usually occurs in the first hour, and diagnosis is usually not even considered.⁷

In our country, there has been an estimate of 60 cases per 100,000 inhabitants/year, based on DVT cases confirmed by phlebography or duplex scanning (DS).⁸ In a study performed in São Paulo, results of 5,261 necropsies were analyzed. PE was found in 10.34% of patients, being the main cause of death in 4.27% of cases. *Ante mortem* rate for unsuspected pulmonary thromboembolism (PTE) was 84%, and 40% of these patients had fatal PTE.⁹ In another study conducted in our country, 767 necropsies were performed between 1985 and 1995, when venous thromboembolism (VTE) was identified in 3.9% of cases; of these, in 83% VTE had not been previously diagnosed or considered.¹⁰

Most VTE cases seem to be associated with clinical situations of well defined risks, called risk factors. For many decades, clinical and epidemiological observations performed by various authors in different countries allowed identification of a series of factors and diseases preceding or following clinical cases of venous thrombosis.¹¹⁻¹³

In the same period, it has been observed that both clinical and surgical patients with a higher number of risk factors were more likely to develop thrombosis, which led many authors to develop prognostic assessment methods using tables. In these tables, each factor is given an absolute or percentage values. If a patient has the sum of those partial values higher than a given value, he is considered a risk patient for thromboembolic disease, and for that reason, deserves special attention, including occasional prophylactic anticoagulating drug therapy.^{14,15}

Nowadays, in our country, the protocol of DVT prophylaxis developed by Sociedade Brasileira de Angiologia e de Cirurgia Vasculiar (SBACV)¹⁴ and the protocol used in a large study performed in 2001 at Hospital Naval Marcilio Dias¹⁶ have been used in the process of risk classification and to define the type of prophylaxis in many studies.

Therefore, every patient that is hospitalized should be assessed as to risk of developing DVT and should be given proper prophylaxis whenever necessary. Effectiveness of that approach has been widely demonstrated in the literature and reassured in national and international consensus statements, with detailed recommendations to all classes of hospitalized patients.^{14,15,17}

However, despite all protocols of DVT prevention being available to all medical practitioners and the large amount of studies and activities developed in this area, recent publications have suggested that adoption of prophylactic measures in general hospitals is still unsatisfactory.¹⁸

This study aims at verifying whether DVT prophylaxis is being routinely and properly used in our service, as well as evaluating physicians' knowledge on risk classifications and indications of drug prophylaxis for DVT, comparing that knowledge to its practical application in their patients.

Methods

A prospective cohort study was carried out from March through May 2007 at Hospital Geral de Roraima, a hospital belonging to the state public network that has 250 beds and is a reference in tertiary medical care to patients aged 13 years or older in the State of Roraima, Brazil. The hospital also provides care to patients of neighboring countries, such as Venezuela and Guiana, and has a partnership with Universidade Federal de Roraima (UFRR). The study was conducted with the protocol approval by the Ethics Committee at UFRR, with the permission of the hospital management and with the patients' consent. Patients were divided into clinical and surgical and stratified into different specialties according to information obtained from medical records. Patients were interviewed after the second hospitalization day, and surgical patients were those submitted to any surgical procedure in current hospitalization.

Exclusion criteria were patients without hospital stay authorization (HSA) and/or permanence shorter than 24 hours, refusal to participate in the study and patients younger than 18 years. Clinical, drug and surgical factors for DVT were assessed in all patients included in the study through a previously developed protocol.

Patients were grouped into low, medium and high risk to develop DVT, and prophylaxis received was compared with proper indication and use of prophylaxis according to the aforementioned protocols.^{14,16} After data were collected, a questionnaire was applied to assistant physicians including seven questions and three hypothetic cases with alternatives regarding proper prophylactic conduct. Physicians answered the questionnaires in the presence of the interviewer, returning them immediately. Finally, results obtained with the questionnaires were correlated to the practice applied by the physicians on their hospitalized patients.

The software Microsoft® Office Excel 2003 was used to table results and create graphs. Data were statistically analyzed using the software Epi-Info 2002®. This software was used to calculate frequencies and percentages of variables, considering as statistically significant $p < 0,05$.

Results

From March through May 2007, 850 patients admitted at Hospital Geral de Roraima met the inclusion criteria and consented to participate in the study, accounting for a total of 36% of hospitalizations in that period; of these, 347 (40.8%) were men and 503 (59.2%) were female. Risk stratification for development of DVT according to gender can be seen in [Table 1](#).

Table 1 - Risk stratification for development of deep venous thrombosis as to gender

Gender	n (%)
Men (n = 347)	
Low risk	128 (36,9)
Medium risk	176 (50,7)
High risk	43 (12,4)
Women (n = 503)	
Low risk	225 (44,7)
Medium risk	235 (46,7)
High risk	43 (8,6)

Proportion of men progressively increased in relation to risk range for development of DVT: 36% in cases of low risk, 42% in moderate risk, and 50% in high risk. That variation is highly significant ($p < 0.03$); the data are shown in [Table 2](#). Patients' age ranged between 18 and 98 years, with mean of 49.87 (± 15.4 years old) and mode of 36 years.

Table 2 - Proportion of men and women in risk categories

Gender	Risk level		
	Low n (%)	Medium n (%)	High n (%)
Men	128 (36,2)	176 (42,8)	43 (50)
Women	225 (63,8)	235 (57,2)	43 (50)
Total	353 (100)	411 (100)	86 (100)

Clinical and surgical patients were subdivided into surveyed specialties. Result can be seen in [Table 3](#).

Table 3 - Division of patients according to specialties

Type of patient	n (%)
Clinical patients (n = 557)	
Cardiology	112 (20)
Nephrology	100 (18)
Infectious diseases	89 (16)
Pneumology	50 (9)
Neurology	67 (12)
Medical clinic	139 (25)
Surgical patients (n = 293)	
General surgery	153 (52)
Oncology	29 (10)
Orthopedics	111 (38)

The five most present risk factors, ordered by frequency, can be identified in [Table 4](#). According to risk stratification, of the 850 patients analyzed, 41.56% were classified as low risk for development of DVT, 48.32% were moderate risk and 10.12% were high risk. Risk stratification for DVT and use of drug prophylaxis observed in medical prescription of patients hospitalized can be found in [Figure 1](#).

Table 4 - Most frequent risk factors

Factor	n (%)
Age older than 40 years	202 (23,8)
Diabetes mellitus	181 (21,5)
Prolonged surgery time	127 (15)
Severe infection	42 (5)
Restriction higher than 3 days	25 (3)

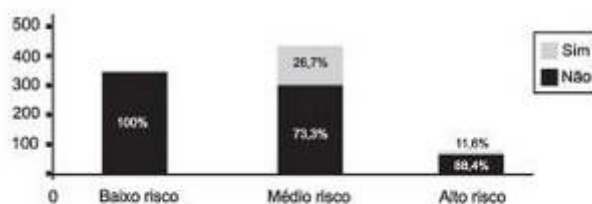


Figure 1 - Result of risk stratification for risk of deep venous thrombosis and use of drug prophylaxis observed in medical prescription for hospitalized patients

Of the total, 557 (66.66%) were clinical patients and 293 (33.34%) were surgical patients. Of clinical patients, 234 were stratified as low risk, 291 as medium risk and 32 as high risk. As to surgical patients, 119 had low risk to develop DVT, 120 medium risk and 54 high risk. Tables 5 and 6 summarize in percentages and absolute numbers patients that required prophylaxis, patients that received it and adequacy in those that were given prophylaxis. These data had major statistical significance ($p < 0,02$).

Table 5 - Prophylaxis for deep venous thrombosis according to risk stratification for clinical and surgical patients

Type of patient/Risk	Prophylaxis		Total
	No n (%)	Yes n (%)	
Clinical			
Low	234 (100)	0 (0)	234
Medium	193 (66,4)	98 (33,6)	291
High	26 (79,7)	6 (20,3)	32
Surgical			
Low	119 (100)	0 (0)	119
Medium	108 (90,3)	12 (9,7)	120
High	50 (93,2)	4 (6,8)	54
Total	730 (85,5)	120 (14,5)	850

Table 6 - Adequacy of prophylaxis for deep venous thrombosis according to risk stratification for clinical and surgical patients

Patient/Risk	Prophylaxis		Total
	Adequate n (%)	Not adequate n (%)	
Clinical			
Medium	87 (88,77)	11 (11,33)	98
High	4 (66,66)	2 (33,34)	6
Surgical			
Medium	10 (83,33)	2 (16,67)	12
High	1 (25)	3 (75)	4
Total	102 (85)	18 (15)	120

Patients receiving prophylaxis had a higher number of risk factors than patients without prophylaxis

(3.1 *versus* 1.9; $p < 0.05$). However, the higher the absolute number of risk factors, the less frequently prophylaxis was used. This fact can be explained by the little or no use of prophylaxis in some patients requiring it. Average number of risk factors was 0.89 in low-risk patients, 2.9 in medium-risk patients and 5.2 in high-risk patients ($p < 0.01$). [Table 7](#) has data on use of prophylaxis presented according to number of risk factors.

Table 7 - Prophylaxis according to number of risk factors

Number of risk factors	Patients without prophylaxis n (%)	Patients with prophylaxis n (%)	Total
0	95 (100)	0 (0)	95
1	258 (100)	0 (0)	258
2	119 (71,6)	47 (28,4)	166
3	98 (72,5)	37 (27,5)	135
4	84 (76,3)	26 (23,7)	110
≥ 5	76 (88,3)	10 (11,7)	86
Total	730 (85,8)	120 (14,2)	850

Comparison of prophylaxis rate used in practice by clinicians and surgeons, in patients indicated to receive it, showed that clinicians prescribe prophylaxis for their patients more frequently than surgeons. Such difference was statistically significant ($p < 0,01$).

As to specialties included in the study, only orthopedics did not use drug prophylaxis for DVT in any patient. Cardiology was the specialty that most used prophylaxis, applying it in 49.39% of cases. There was no statistically significant difference in use of prophylaxis between surveyed specialties. Percentage of prophylaxis use in surveyed specialties is shown in [Figure 2](#).

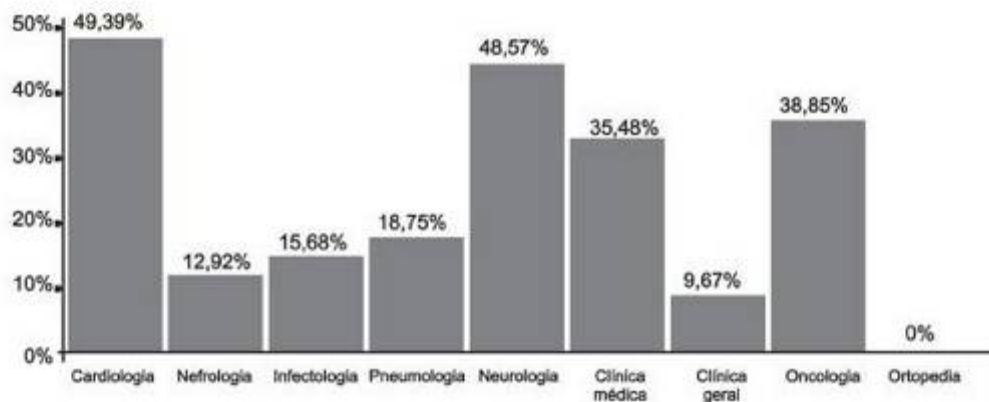


Figure 2 - Percentage of prophylaxis use in surveyed specialties

From March through May 2007, 62 physicians had patients included in our study. Of these, 93% agreed to answer the questionnaire, 5% did not agree, and 2% were no longer working in our service. Thus, 58 physicians answered the questionnaire. Of these, 31 were surgeons and 27 were clinicians. Obtained results are shown in [Tables 8](#) and [9](#).

Table 8 - Medical knowledge regarding deep venous thrombosis

Medical knowledge	Total (n = 58) n (%)	Clinicians (n = 27) n (%)	Surgeons (n = 31) n (%)	p
Knows incidence	18 (31,1)	7 (25,9)	11 (35,5)	NS
Knows risk factors	58 (100)	27 (100)	31 (100)	NS
Knows how many and which risk groups there are	15 (25,8)	7 (25,9)	8 (25,8)	NS
Knows prophylactic methods	56 (96,5)	25 (92,5)	31 (100)	NS
Knows how to use prophylactic methods	51 (87,9)	20 (74,1)	31 (100)	NS
Was there any case of DVT in your clinical practice?	43 (74,2)	23 (85,1)	20 (64,5)	NS

DVT = deep venous thrombosis; NS = nonsignificant.

Table 9 - Physicians' response as to frequency of prophylaxis use for deep venous thrombosis in their patients

Frequency of prophylaxis use	Total (n = 58) n (%)	Clinicians (n = 27) n (%)	Surgeons (n = 31) n (%)	p
Always	8 (13,9)	3 (11,1)	5 (16,1)	NS
Frequently	25 (43,1)	14 (51,9)	11 (35,5)	NS
Occasionally	17 (29,3)	7 (25,9)	10 (32,3)	NS
Rarely	8 (13,9)	3 (11,1)	5 (16,1)	NS
Never	0 (0)	0 (0)	0 (0)	NS

NS = nonsignificant.

Discussion

Risk of VTE is high in surgical patients and in those hospitalized for treatment of clinical diseases. In the existing literature on this theme, the importance and benefits of proper and effective drug prophylaxis in relation to DVT is well documented, and is widely supported for being better regarding all aspects in the treatment of settled disease. Results of varied controlled and randomized studies have served to demonstrate interventions able to significantly reduce risk of VTE in these patients.^{11,13,15} However, VTE is still the main cause of sudden death in hospitalized patients,⁵ probably due to lack of information about its incidence. In a study carried out in 1998, including 300 physicians in Brazil, only 15.6% of them were fully aware of VTE incidence.¹⁹

A study performed in 2004 revealed that 38.46% of interviewed physicians were aware of DVT incidence.²⁰ At Hospital Geral de Roraima, 31.1% of physicians reported knowing DVT incidence in our country. In our study and in others, such as those by Marchi et al.,²¹ Caiafa & Bastos,¹⁶ Rocha et al.²² and Deheinzelin et al.,²³ all performed in Brazil, and those by Vallano et al.²⁴ and Chopard et al.,²⁵ performed in other countries, we can observe that most physicians do not submit patients with identified risk of DVT to prophylaxis (Table 10). According to Arnold et al., inadequate prophylaxis is more frequently caused by omission, followed by improper duration and incorrect choice of prophylactic method.¹⁸ It can be seen in Table 10 that DVT prophylaxis, although accessible, is still little used, even in developed countries.

Table 10 - Comparison between our study and others

	Required prophylaxis* n (%)	Received prophylaxis* n (%)	No prophylaxis* n (%)	Adequate prophylaxis† n (%)	Inadequate prophylaxis† n (%)
Marchi et al. ²¹	621 (63,2)	124 (12,61)	859 (87,39)	46 (37,1)	78 (62,9)
Caiafa & Bastos ¹⁶	8892 (47,57)	2706 (14,4)	6.374 (34,1)	7.388 (59,99)	4.928 (40,01)
Rocha et al. ²²	130 (62,5)	112 (53,8)	96 (46,2)	70 (62,5)	42 (37,5)
Deheinzelin et al. ²³	738 (61,14)	524 (43,41)	683 (56,59)	224 (42,7)	300 (57,3)
Our study	497 (58,47)	120 (14,2)	730 (85,8)	102 (85)	18 (15)
Vallano et al. ²⁴	297 (80,9)	225 (61,3)	142 (38,7)	101 (44,8)	124 (55,2)
Chopard et al. ²⁵	664 (60,5)	542 (49,4)	555 (50,6)	153 (27,5)	402 (72,5)

* Patients that needed drug prophylaxis (medium and high risk).

† Percentage regarding patients given drug prophylaxis.

A study published in 1999 demonstrated that there are failures in identification and risk classification of patients. Risk factors such as immobility and obesity were easily remembered. However, risk of thrombosis associated with cancer was underestimated.²⁶ Another possible factor for not using prophylaxis, especially in surgical patients, can be fear of major bleeding, although it has been demonstrated that use of prophylactic agents did not increase risk of bleeding during procedures.²⁷

The most frequent risk factors found in our patients were, respectively, age older than 40 years (23.8%), diabetes mellitus (21.5%), prolonged surgery time (15%), severe infection (5%) and bed restriction longer than 3 days (3%). In the study by Caiafa & Bastos, the main risk factors were age older than 40 years (25.8%), pregnancy (25.3%), prolonged surgery time (16.1%) and obesity (5.8%).¹⁶ In a study performed in Spain, the main risk factors were age older than 40 years (84%), major surgeries (37%), immobilization (36.5%), cancer (32%), obesity (15%), and congestive heart failure (6%).²⁴ As can be seen, age older than 40 years was the most frequently found risk factor in all three studies.

In our study, of the 497 patients indicated to receive prophylaxis, 377 did not receive it. Considering the two main divisions used, more omission was observed in surgical patients: 90% (158/174) of medium- and high-risk patients were not given drug prophylaxis. In the clinical group, 32.2% (104/323) of patients with indication were not given prophylaxis. These results are similar to those found in the literature,^{16,20,21} being only different from the results found in a study carried out in Bahia, Brazil, in 2006, in which lack of prophylaxis was more frequently found among clinical patients.²² The data show that we had one of the worst rates as to number of patients who were given prophylaxis when indicated. On the other hand, as to proper prophylaxis in patients who were given it, our results showed the best adequacy rate compared to studies analyzing this variant. In our study, prophylaxis was properly performed in 85% of patients, having high statistical significance ($p < 0,05$). In our hospital, the main failure is found in medium-risk patients, and surgeons prescribe prophylaxis less frequently than clinicians. Cardiology was the specialty that most used prophylaxis for DVT, but it was not satisfactory in any specialty. In more than 2/3 of patients with potential risk of DVT development, any prophylactic measure was performed.

With regard to knowledge of DVT by practitioners that had their patients analyzed in our study, it has been demonstrated that, although most physicians claim knowing risk groups and are aware of the proper prophylaxis for each group, they do not have enough mastering of the theory, according to the result obtained in correction of clinical cases. Perhaps due to this fact physicians at Hospital Geral de Roraima do not use prophylaxis for DVT more frequently. A curious fact obtained in our study was that, despite clinicians having prescribed prophylaxis for DVT more frequently and properly, surgeons had a better theoretical knowledge of the theme, even if they did not use it satisfactorily in daily practice.

Such inadequacy in medical conduct regarding DVT prophylaxis is not unusual, despite the disclosure of prophylactic recommendations over the past 2 decades. In the USA, only a minority of physicians performs systematic prophylaxis, which is more used in university units. A prospective study performed in 1994 showed increase in use of prophylaxis from 29 to 52% in hospitalized patients with potential risk of developing venous thrombosis after implementation of a continuous education program, which has thromboembolism as the main theme, showing that interventions of that nature are extremely important. That same study confirmed that in hospitals in which physicians continuously participated in education programs, use of prophylaxis was higher.²⁷

In 1999, Caiafa & Bastos²⁸ started a Brazilian register with the aim of investigating incidence of risk factors for TVE in clinical and surgical hospitalized patients and investigating use of prophylaxis in these populations. Data obtained showed significant improvement in rates of drug prophylaxis use for DVT, a result that can be explained by the implementation of a continuous education system during the study.²⁸

Conclusion

Despite the benefits of prophylaxis for DVT being widely confirmed in the literature, it is not practiced by many physicians, both clinicians and surgeons, as corroborated in many studies, including ours, performed at Hospital Geral de Roraima. The fact can be explained by the unsatisfactory theoretical knowledge shown by such practitioners.

This study demonstrates that non-use of prophylaxis for DVT can be a consequence of physicians' lack of knowledge of its indications. Therefore, new strategies, such as continuous education and awareness programs, should be developed, encouraged and applied to improve theoretical knowledge and practical use of that knowledge by medical practitioners, so that improvement in rates of prophylaxis use in hospitalized patients can be expected.

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