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ORIGINAL ARTICLE

Incorrect use of thromboprophylaxis for venous thromboembolism in medical and surgical patients: results of a multicentric, observational and cross-sectional study in Brazil

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Summary. *Objectives:* Although effective strategies for the prevention of venous thromboembolism (VTE) are widely available, a significant number of patients still develop VTE because appropriate thromboprophylaxis is not correctly prescribed. We conducted this study to estimate the risk profile for VTE and the employment of adequate thromboprophylaxis procedures in patients admitted to hospitals in the state of São Paulo, Brazil. *Methods:* Four hospitals were included in this study. Data on risk factors for VTE and prescription of pharmacological and non-pharmacological thromboprophylaxis were collected from 1454 randomly chosen patients (589 surgical and 865 clinical). Case report forms were filled according to medical and nursing records. Physicians were unaware of the survey. Three risk assessment models were used: American College of Chest Physicians (ACCP) Guidelines, Caprini score, and the International Union of Angiololy Consensus Statement (IUAS). The ACCP score classifies VTE risk in surgical patients and the others classify VTE risk in surgical and clinical patients. Contingency tables were built presenting the joined distribution of the risk score and the prescription of any pharmacological and non-pharmacological thromboprophylaxis (yes or no). *Results:* According to the Caprini score, 29% of the patients with the highest risk for VTE were not prescribed any thromboprophylaxis. Considering the patients under moderate, high or highest risk who should be receiving prophylaxis, 37% and 29% were not prescribed thromboprophylaxis according to ACCP (surgical patients) and IUAS risk scores, respectively. In contrast, 27% and 42% of the patients at low risk of VTE, according to Caprini and IUAS scores, respectively, had thromboprophylaxis prescribed. *Conclusion:* Despite the existence of several guidelines, this study demonstrates that adequate thromboprophylaxis is not correctly prescribed: high-risk patients are under-treated and low-risk patients are over-treated. This condition must be changed to insure that patients receive adequate treatment for the prevention of thromboembolism.

Keywords: audit, prophylaxis, venous thromboembolism.

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Introduction

Prophylaxis against venous thromboembolism (VTE), based on the high rates of morbidity and mortality associated with the disease, has been advocated for a long time [1]. More recently, prophylaxis against VTE using different agents was shown to be effective in controlled randomized trials [2–4]. At least two international evidence-based consensus panels derived guidelines for risk stratification and prophylaxis accordingly [5–6]. Using clinical data available at case presentation, these guidelines classify surgical and medical patients in high, medium, and low-risk categories. Another risk assessment model was proposed utilizing even more simplified information and classifying almost every inpatient in one of four categories: very high, high, medium, and low risk [7]. For all the guidelines, risk categories were designed according to the reported incidence of VTE events. As such, based on these risk stratifications, patients should be either receiving or not receiving appropriate thromboprophylaxis. However, real-world reports observed that < 50% of the inpatients with confirmed deep vein thrombosis are receiving adequate prophylaxis [8]. Consequently, it was estimated that one out of six cases of VTE could be prevented [9].

Convincing explanations for this situation are lacking, although recent surveys have suggested the following: a high concern about serious adverse effects (bleeding); non-uniform rates of prophylaxis prescription among different medical specialties; and the need for more specific guidelines according to the disease [10–13]. However, data are not available regarding the quality of the information retrieved from medical charts, the quality of the prevention treatment delivered to patients and the relation of these variables with the clinical characteristics of the patients. A clinical process audit was conduced in order to identify the dimensions of this problem and whether these factors could influence the VTE-prevention treatment for patients admitted to hospitals in the state of São Paulo, Brazil.

Population and hospital characteristics

The state of São Paulo is responsible for the greatest gross domestic product of the country and hosts the more important and leading healthcare institutions in Brazil. Four hospitals from São Paulo (three teaching and one non-teaching) were selected to participate in the audit. Case-report forms and technical aspects regarding the retrieval of information from medical charts were evaluated in a previous pilot study including 324 individuals. This indicated that a sample size of 1400 subjects would be necessary to give power to the main study. Data were collected during the period from August 9 to November 4, 2004 in a 1-day fashion, in order to avoid duplication of data and modification of drugs availability and medical residents program in teaching hospitals. Patients older than 18 years old were randomly chosen to participate in the survey. Seven different medical specialties were chosen because of the increased prevalence of patients at risk of VTE: orthopedics, gastric surgery, urology, oncology, internal medicine, gynecology, and intensive care.

Methods

This is an observational cross-sectional study. Data collection strategy consisted of analyzing, by a group of physicians, the medical charts of randomly selected patients in four different hospitals. A clinical process audit was taken from medical charts and, when necessary, nursing records. Data on risk factors for VTE and prescription of pharmacological and non-pharmacological thromboprophylaxis were collected. No previous warning was given to nurses and patients until the moment of data collection.

Physicians were unaware of the survey. Three risk assessment models were applied using data obtained from the medical charts: American College of Chest Physicians (ACCP) Guidelines, Caprini score, and the International Union of Angiology Consensus Statement (IUAS) [5–7]. The ACCP score classifies VTE risk in surgical patients and the others classify VTE risk in surgical and medical patients.

Descriptive analysis of data was performed including demographic, clinical, and surgical variables. Contingency tables were built presenting the joined distribution of the risk scores, the prescription of any pharmacological and non-pharmacological thromboprophylaxis (yes or no), and, when applicable, the adequacy of the pharmacological treatment. For this study, the adequacy of the pharmacological treatment was distributed in two predefined categories: adequate, when anticoagulant therapy was prescribed alone or in combination with antiplatelets in predefined regimens (Table 1), or inadequate when this condition was not fulfilled. The predefined regimens adopted for this study were based on a combination of available guidelines, and local hospital practices.

The thromboprophylactic treatment was considered adequate when one of the two options depicted in Table 1 were prescribed. Chi-squared test was used to estimate the presence of association between variables of interest and the differences between the variables were analyzed using the test of the comparison of the means. The quality of information disclosed on medical charts could be insufficient for the application of the risk assessment models. Quality of information was previously defined according to the possibility (yes or no) of the calculation of the risk score. As this feature could have influence on thromboprophylaxis, the adequacy of the treatment was analyzed according to the quality of information. Finally, in a *post-hoc* defined fashion, thromboprophylaxis

Table 1 Adequacy of thromboprophylactic treatment according to baseline condition

	Adequate treatment	
Baseline condition	Option 1	Option 2
Surgical patient, moderate risk of VTE	Heparin, 5000 U q12 h	Dalteparin 2500 mg or enoxaparin 20 mg, once daily
Surgical patient, high risk of VTE	Heparin, 5000 U q8 h	Dalteparin 5000 mg or enoxaparin 40 mg, once daily
Surgical patient, high risk and multiple risk factors for VTE	Heparin, 5000 U q8 h + leg compression devices	Dalteparin 5000 mg or enoxaparin 40 mg, once daily and leg compression devices
Major gynecologic or urologic surgery	Heparin, 5000 U q8–12 h	Dalteparin 5000 mg or enoxaparin 40 mg, once daily and leg compression devices
Elective major lower extremity arthroplasty	Warfarin, target INR 2–3	Dalteparin 2500 mg or enoxaparin 40 mg, once daily
Acute hip, pelvis, leg fracture	Heparin, 5000 U q8–12 h or warfarin, target INR 2–3	Dalteparin 2500 mg or enoxaparin 40 mg, once daily
Medical patients, moderate/high risk	Heparin, 5000 U q8 h	Dalteparin 5000 mg or enoxaparin 40 mg, once daily

VTE, venous thromboembolism; INR, International Normalized Ratio.

adequacy was also analyzed according to distribution in quartiles of age.

Results

Data from 1454 patients (865 clinical and 589 surgical) were collected in the audit. More than 80% of the patients scored by ACCP and Caprini indexes and 61% scored by IUAS index were at a moderate to high risk of developing a VTE, disclosing a population that needs special attention (Table 2).

Thromboprophylaxis was prescribed to 566 patients. According to the Caprini score, 29% of the patients at the highest risk for VTE were not prescribed any thromboprophylaxis. Considering the patients under moderate, high or highest risk who should be receiving prophylaxis, 37% and 29% were not prescribed thromboprophylaxis according to ACCP (surgical patients) and IUAS risk scores, respectively. In contrast, 27% and 42% of the patients at low risk of VTE according to Caprini and IUAS scores, respectively, had thromboprophylaxis prescribed.

Regarding the quality of information retrieved and its influence on the adequacy of treatment, 42 (8%) subjects who received thromboprophylaxis could not be classified by IUAS or ACCP scores (Table 3). The analysis of the quality of the prevention treatment disclosed that 279 (49%) patients were prescribed inadequate thromboprophylaxis and that the rate of inadequacy seems to be the similar in all levels of risk (Fig. 1). Moreover, surgical patients were more prone to be prescribed with adequate treatment than were medical patients (50% vs. 36%, $P < 0.05$). When comparing patients who could be classified (good quality of information) with those who could not, no significant difference was observed between the two groups regarding the adequacy of thromboprophylaxis.

Finally, we observed an increment in the rate of inadequate thromboprophylaxis in patients older than 65 years of age when compared with subjects in the first quartile ($P < 0.05$; Fig. 2).

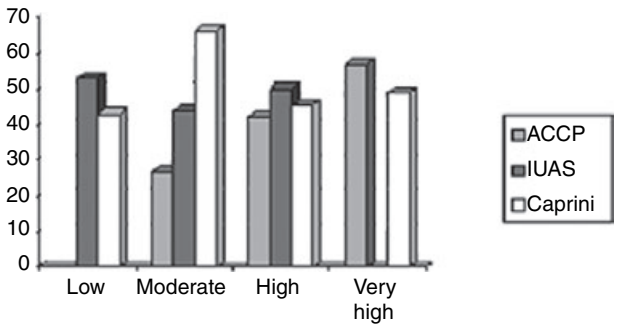

Fig. 1. Inadequacy rates of treatment for the prevention of venous thromboembolism in the different levels of risk defined by the risk score indexes.

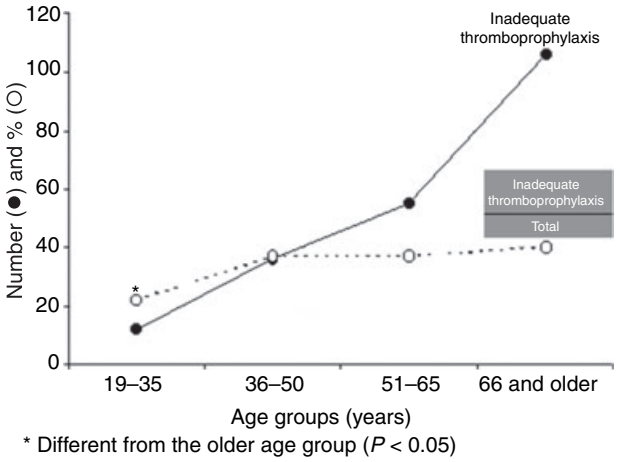

Fig. 2. Rates of inadequate thromboprophylaxis distributed by age.

Table 2 Distribution of patients according to risk score index used and risk level

Risk score index	IUAS (%)	ACCP (%)	Caprini (%)
Low	469 (39)	12 (2)	142 (10)
Moderate	90 (7)	86 (15)	141 (10)
High	648 (54)	260 (44)	345 (24)
Very high	N/A	231 (39)	826 (57)
Total	1207 (100)	589 (100)	1454 (100)

ACCP, American College of Chest Physicians Guidelines; IUAS, International Union of Angiology Consensus Statement; N/A, not available.

Table 3 Adequacy of thromboprophylaxis according to quality of information retrieved (patients that could and could not be scored by International Union of Angiology Consensus Statement and American College of Chest Physicians Guidelines)

	Thromboprophylaxis		
Quality of information	Adequate (%)	Inadequate (%)	Total (%)
Poor (not classified)	23 (54.8)	19 (45.2)	42 (7.4)
Good (classified)	224 (42.7)	300 (57.3)	524 (92.6)

Discussion

Despite the presence of many different strategies to treat the consequences of this disease, in particular pulmonary embolism, VTE remains a major concerning complication for patients admitted to healthcare institutions. In order to establish correct prophylactic management, several risk factors and clinical conditions had been identified in association with thromboembolism. Taken together in the composition of risk score indexes, this information constituted a valuable tool for the identification of targeted population for thromboprophylaxis. Depending on the risk score index utilized, our audit identified from 60% to more than 80% of the patients studied to be at risk for thromboembolism. As such, these patients should receive prophylaxis. Although high, these findings are in accordance with recent studies including only medically ill patients [14–16]. However, around one-third of the patients at risk were not

prescribed pharmacological thromboembolism prophylaxis. On the other hand, the same proportion of patients classified as being at low risk of VTE had thromboprophylaxis included in the medical prescription. More importantly, we found that the information available in medical records allowed the risk stratification for more than 90% of the cases. Therefore, our data suggest that the incorrect thromboprophylaxis both in medical and in surgical patients is not due to the lack of clinical data required for the risk assessment models.

The finding that almost one-third of the patients at risk do not receive adequate prophylaxis is in accordance with data collected in previous audits [14–17]. The over-use of prophylaxis in up to one-third of the patients at low risk was also reported in previous studies [14,15,18]. The low prophylaxis rate observed in high-risk patients is frequently attributed to the 'fear' of bleeding [19]. In line with that possibility, we found that surgical patients were prescribed non-pharmacological prophylaxis alone more frequently than medically ill patients (data not shown). However, the high over-use rate observed in our study seems contradictory to that hypothesis. Moreover, it was recently shown that increased awareness of the necessity of prophylaxis was accompanied by increased use in low-risk patients [15]. Unfortunately, patient's risk of bleeding was not assessed in the present study and therefore this question cannot be fully answered.

In addition, we found that inadequate prophylaxis correlated with age, being more frequent in older patients despite their higher risk. The same picture was observed with anticoagulant use in atrial fibrillation patients [20]. This latter feature among older patients is worrisome because it indicates that the fear of complications can overcome scientific knowledge. In this scenario, data collected imply definite lack of risk stratification use, despite information available in the medical records allowing it in more than 90% of the cases. Therefore, we conclude that the incorrect use of thromboprophylaxis both in medical and in surgical patients is not due to the lack of clinical data needed for the risk assessment models proposed. Difficulties in using the guidelines and cumbersomeness are frequently quoted as reasons to avoid these models [19,21].

Conversely, our results suggest that this may not be the case, because most of the patients could be appropriately classified. Indeed, it has been shown that almost any strategy can improve the utilization of thromboprophylaxis using different protocols [22]. In conclusion, despite the existence of several guidelines, some of them being regularly updated [23], adequate thromboprophylaxis is not being correctly prescribed: high-risk patients are under-treated and low-risk patients are over-treated. This situation cannot be ascribed to the lack of clinical data necessary for risk assessment. Certainly the reasons for that must be carefully reviewed to insure that patients receive the care they need.

Addendum

The present study was given the acronym Trombo Risc. The complete list of all participants in the Trombo Risc trial is presented below. All authors participated in the study design, data collection and data interpretation. A. L. Braga performed most statistical analyses, D. Deheinzelin and B. Caramelli wrote the manuscript. The final version was approved by all authors.

Trombo Risc participants: E. A. D'amico, W. Jacob, M. do Carmo Sitta, R. Bagnatori, L. Fornari, P. Saldiva and G. Schettino.

Conflict of interest disclosure

The Trombo Risc trial received a partial grant from Astra Zeneca Brazil.

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