

# Assessment of risk for venous thromboembolism in hospital emergency departments: an analysis of concordance between scales

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The authors declare no conflict of interest.

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**Background and objective:** Little information is available on differences between scales used to assess risk for venous thromboembolism (VTE) in patients with medical conditions admitted from hospital emergency departments. We aimed to evaluate the agreement between 2 risk prediction tools: a scale based on the PRETEMED guideline and the Padua Prediction Score (PPS).

**Methods:** Prospective multicenter cohort study in 6 Spanish hospital emergency departments. Patients with medical conditions requiring hospital admission were included between December 2011 and July 2012. The concordance correlation between the 2 scales was calculated. The development of VTE was registered for 90 days.

**Results:** Of 610 patients recruited, data for 580 patients (mean [SD] age, 70.1 [16.9] years; 45.3% women) were valid for assessment. Patients classified as having moderate or high risk numbered 256 (44.1%) with the PRETEMED scale and 368 (63.4%) with the PPS. The  $\kappa$  index of concordance between the 2 scales was 0.39 (95% CI, 0.32–0.46) (discordance, 31.3%). Among patients who did not receive thromboprophylaxis, the incidence of VTE was 2.3% among the 129 patients the PRETEMED scale classified as being at moderate or high risk and 3.5% among patients at high risk according to the PPS.

**Conclusions:** There is disagreement between PRETEMED and PPS scale assessments of risk for VTE in patients with medical conditions. The PPS classified more patients as being at high risk, and the predictions were more accurate based on their later development of VTE. [Emergencias 2014;26:349-353]

**Keywords:** Thromboprophylaxis. Hospital emergency health services. Venous thromboembolism.

## Introduction

Hospitalization for acute medical conditions increases by eight times the risk of venous thromboembolism (VTE)<sup>1</sup>. In fact, it represents a quarter of the population with thromboembolic events<sup>2</sup>, is more serious than the VTE found in outpatients,

and is most often the origin of fatal pulmonary embolism<sup>1,3</sup>. The introduction of prevention protocols has achieved a significant reduction in the incidence of this disease. Emergency departments (EDs) are ideal for identifying patients at risk for VTE. Thromboprophylaxis, however, is often inadequate<sup>4</sup>. In addition, there are different models

for risk assessment of VTE that are used heterogeneously<sup>5,6</sup>. The two most widely used in our setting are perhaps the PRETEMED<sup>7</sup> guidelines and the Padua Prediction Score (PPS), which is currently recommended by the American College of Chest Physicians (ACCP)<sup>8,9</sup>.

There are few data on the differences in classifying risk according to which scales are used. It is not known which one best classifies the risk of VTE in ED patients who are hospitalized for medical conditions. Gallardo et al. evaluated the correlation between PRETEMED guidelines and recommendations of the Eighth Conference of the ACCP, and found significant differences in risk assessment<sup>10</sup>. The aim of this study was to evaluate the correlation between PPS and PRETEMED guidelines in patients hospitalized from the ED for medical conditions. As a secondary objective, the incidence of VTE over 90 days was analyzed, according to the risk group assessed by the two scales, to determine which scale best classified patients.

## Method

A multicenter prospective cohort study was conducted in six Spanish hospital EDs located in four autonomous communities (Hospital Clínic of Barcelona, Hospital Universitari de Bellvitge de Hospitalet de Llobregat, Hospital Clínico San Carlos in Madrid, Getafe University Hospital, Hospital Donostia San Sebastian General Hospital of Alicante). The recruitment period was between December 2, 2011 and July 3, 2012.

The study included patients aged 18 years or more seen in the ED for medical causes and who required hospitalization and signed informed consent. Patients were included in the study by opportunity sampling depending on the workday of the researcher. Patients receiving or requiring anti-coagulant therapy were excluded.

The primary outcome variable was the calculation and classification of risk of VTE according to the latest 2007<sup>7</sup> version of the PRETEMED guidelines and the PPS<sup>8</sup>. The secondary outcome variable was thromboembolic events at 90 days.

Independent variables included demographics, medical history, reason for admission, risk factors for VTE and pharmacologic thromboprophylaxis (Table 1).

The PPS and PRETEMED scales assign different adjusted weights to a number of risk factors for VTE. PRETEMED classifies patients into three categories: low, moderate or high risk. In patients with modera-

te risk (4 points), the guidelines suggest pharmacological prophylaxis, and for high risk (> 4) this is recommended. The PPS recommends prophylaxis in patients at high risk ( $\geq 4$  points). Mobility was classified as normal, reduced (bed / toilet / bed, bed / couch / bed) or no (complete bed rest).

**Table 1.** Characteristics of the patient cohort studied

	Total (N = 580)
<b>Demographics</b>	
Age [mean (SD)]	70.1 (16.9)
Female [N (%)]	252 (43.4)
Body mass index [mean (SD)]	25.9 $\pm$ 4.1
<b>Personal medical history [N (%)]</b>	
Thrombophilia	7 (1.2)
Prior thromboembolism	10 (1.7)
Heart Failure	84 (14.5)
Obesity	110 (19)
Chronic obstructive pulmonary disease	126 (21.7)
Hormone Treatment	7 (1.2)
Pregnancy <3 months	0
Immobility	89 (15.3)
Active neoplasia	91 (15.7)
Chemotherapy	48 (8.3)
Acute infection	218 (37.6)
Central Venous Catheter (CVC)	8 (1.4)
Inflammatory bowel disease	6 (1)
Myeloma	3 (0.5)
Lower limb paralysis	16 (2.8)
Age > 60 years	435 (75.1)
Smoking	101 (17.4)
<b>Reason for admission [N (%)]</b>	
Chronic obstructive pulmonary disease	79 (13.6)
Respiratory infection	180 (31.0)
Kidney Disease	41 (7.1)
Urinary tract infection	48 (8.3)
Gastrointestinal disease	54 (9.3)
Hepatobiliary disease	37 (6.4)
Endocrine-metabolic disease	12 (2.1)
Hematologic disease	19 (3.3)
Neurodegenerative disease	14 (2.4)
Ischemic stroke	24 (4.1)
Cerebral hemorrhage	5 (0.9)
Neoplasia	50 (8.6)
Heart failure (NYHA III / IV)	43 (7.4)
Rheumatological disease	5 (0.9)
Other medical illnesses	146 (25.2)
<b>Risk factors for VTE on admission [N (%)]</b>	
Complete immobilization	58 (10.0)
Disabled	300 (51.7)
Admission to intensive care	15 (2.6)
CVC	11 (1.9)
Mechanical Ventilation	8 (1.4)
<b>Classification of risk for VTE [N (%)]</b>	
PRETEMED	
Moderate or high risk	256 (44.1)
Low risk	324 (55.9)
<b>Padua prediction score</b>	
High risk	368 (63.4)
Low risk	212 (36.6)
Thromboprophylaxis on admission	222* (39.7)
Mortality at 90 days	79* (14.1)
Episodes of VTE at 90 days	16* (2.9)

\*Of the 580 patients, 21 (3.6%) were lost to follow-up at 3 months. VTE: venous thromboembolism.

Data collection was performed by e-Clinical methodology based on input through a secure website. Each patient was evaluated in the ED prior to hospitalization, and was followed during that time. The evaluation was performed by an ED physician, but in no case was he or she responsible for patient treatment and management. For the 90-day follow-up, patient information was obtained by telephone interview. The study was approved by the Ethics Committee for Clinical Research of the 6 centers, and all patients signed informed consent.

For qualitative variables we used absolute and relative frequencies. For quantitative variables we used measures of central tendency and dispersion [mean and standard deviation (SD) or median and interquartile range (IQR) in case of asymmetry]. To assess agreement between the two scales, kappa was calculated. For comparisons we used chi-square or Fisher's exact test for qualitative variables; and Student's t test or the median test was used for quantitative variables. Differences between groups were statistically significant when the p value was less than 0.05. Statistical analysis was performed using SPSS 19.0.

## Results

A total of 610 patients met the inclusion criteria and were recruited. However, the PRETEMED score was not available for 30 patients, so they were excluded from the analysis, which left 580 patients (95.1%). Table 1 shows the characteristics of the participants. In 256 patients (44.1%, 95% CI 40.0 to 48.3) PRETEMED risk scores were greater than or equal to 4, and patients were considered as being at moderate or high risk. In 368 patients (63.4%, 95% CI 61.4 to 65.4) the PPS risk score was greater than or equal to 4 (high risk). Agreement between the two scales was poor, with a kappa value of 0.39 (95% CI: 0.32 to 0.46,  $p < 0.001$ ). Disagreement between the scales was 31.3% (Table 2).

At 90 days, 3.6% were lost to follow-up (21 patients). Mortality was 14.1% (Tables 1 and 3). The incidence of VTE during follow-up, by scale classification, is shown in Table 3.

## Discussion

The results of our study indicate poor agreement (kappa 0.39) between PPS and PRETEMED scales to assess the risk of VTE in patients hospita-

**Table 2.** Agreement between scales of VTE risk in patients with medical conditions (PRETEMED and Padua Prediction Score -PPS-)

	Risk according to PRETEMED scale		
	Low	Moderate or high	Total
<b>PPS risk [N (%)]</b>			
Low	177 (30.5)	35 (6.0)	212 (36.6)
High	147 (25.3)	221 (38.1)	368 (63.4)
<b>Total</b>	<b>324 (55.9)</b>	<b>256 (44.1)</b>	<b>580</b>

Concordance: 68.6% (398 patients). Discordance: 31.3% (182 patients). Kappa 0.39 (95% CI: 0.32 to 0.46  $p < 0.001$ ).

lized for medical conditions from the ED. The percentage of disagreement between the two scales was high (31.3%). Given the high morbidity and mortality of VTE, especially in hospitalized medical patients, and its high frequency, the challenge of this condition is precisely<sup>1-3</sup> thromboprophylaxis, whose efficacy is well established<sup>11</sup>. Therefore, optimal risk stratification is vitally important to establish which patients should receive this treatment. The discordance between the different scales used could endanger patients potentially misclassified by either scale.

Patients classified as having moderate or high risk numbered 256 (44.1%) with the PRETEMED scale and 368 (63.4%) with the PPS. Among patients who did not receive thromboprophylaxis, the incidence of VTE was 2.3% among the 129 patients the PRETEMED scale classified as being at moderate or high risk and 3.5% among patients at high risk according to the PPS. These data suggest that PPS is better able to classify patients at risk for VTE and avoid further potential thromboembolic events. The incidence of VTE in high-risk patients was lower than that found in the study by Barbar et al., from which the PPS<sup>8</sup> was derived. However, the populations of the two studies are not comparable. The two studies applied different criteria. Ours was a multicenter study while that

**Table 3.** Thromboembolism events at 3 months follow-up according to risk group classified by PRETEMED scale and Padua Prediction Score (PPS)

	PRETEMED (N = 559)	PPS (N = 559)
Moderate to high risk [n (%)]	246 (44.0)	351 (62.8)
VTE Events	8 (3.3)	12 (3.4)
Deaths	54 (22.0)	72 (20.5)
Moderate to high risk without thromboprophylaxis [n (%)]	129 (52.4)	201 (57.3)
VTE Events	3 (2.3)	7 (3.5)
Deaths	26 (20.2)	34 (16.9)
Low risk [n (%)]	313 (56.0)	208 (37.2)
VTE Events	8 (2.6)	4 (1.9)
Deaths	25 (8.0)	7 (3.4)

VTE: venous thromboembolism.

of Barbar et al. was performed in a single Italian center. In any case, although our results were less conclusive, they are consistent with those published previously, and confirm the ability of the PPS scale to correctly assess the risk of VTE in hospitalized patients with medical illness.

The PPS scale was more conservative, in our study, because it classified more patients as being at high-risk (63.4% versus 44.1%) as compared with the PRETEMED scale. This is partly because the PPS assigns 3 points to the condition of reduced mobility, highly prevalent among patients requiring hospitalization for medical causes, while the PRETEMED scale assigns only one point if the patient is bedridden for four days. In our study, reduced mobility was present in 51.7% of patients and complete immobility in 10.0%.

The PPS scale was derived from a cohort of patients hospitalized for medical conditions<sup>8</sup>. The PRETEMED scale, however, was developed for patients with acute medical conditions, whether or not they required hospitalization, and it was not derived or validated, but was obtained by a consensus of experts using the power of the different risk factors reflected in epidemiological studies<sup>7</sup>.

Obviously the best way to determine the risk of VTE in an individual patient is from an adjusted estimate of individual risk. Until the appearance of scales such as PRETEMED, PPS and others, the only information available was lists of factors associated with more or less risk of developing thromboembolic events. Although none of these scales has been convincingly validated (they are derived from epidemiological studies and the weight assigned to each factor depends on the specific odds ratios), they are, for now, a suitable tool. Validation studies are required, even for different scenarios: medical patients requiring admission or not and outpatients at home.

Regarding study limitations, first, to ensure observer reliability, the study was conducted on their workdays. This conditioned our use of opportunity sampling, so the representativeness of the patients is unknown, which limits the external validity of the study. However, the final sample size, the days sampled within the study period and the results that were consistent with those of previous studies which included all consecutive cases suggest a low likelihood of bias. Second, the study design assumed that patients could be affected by other exposures during follow-up (development of risk factors for VTE, bleeding or death) not considered or collected, which could lead to a greater or lesser risk of a thromboembolic event, including death or hemorrhage.

In conclusion, we found a significant discre-

pancy between the scales used (PRETEMED and PPS) to assess the risk of VTE in patients hospitalized for medical conditions. The PPS scale seems more appropriate, since it classified patients better and was more conservative in a potentially life-threatening disease.

## Addendum

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## **Ketamina a dosis bajas asociada a morfina mejora el control del dolor en urgencias en el paciente con traumatismo**

**Ruiz-Artacho P, Merlo Loranca M, Carrizosa Bach MM, Antolín Santaliestra A, Llorens Soriano P, Jiménez Hernández S**

**Objetivos:** Existen pocos datos sobre las diferencias entre las escalas utilizadas, en los servicios de urgencias hospitalarios (SUH), para la valoración del riesgo de enfermedad tromboembólica venosa (ETV) en pacientes que ingresan por patología médica. El objetivo fue analizar la concordancia entre la guía PRETEMED y el *Padua Prediction Score* (PPS).

**Método:** Estudio de cohortes prospectivo multicéntrico, realizado en seis SUH españoles. Se incluyeron pacientes con patología médica que requirieron ingreso hospitalario entre diciembre de 2011 y julio de 2012. Se evaluó la concordancia de ambas escalas para clasificar a los pacientes en las diferentes categorías de riesgo. Además, se recogieron los acontecimientos tromboembólicos durante 90 días.

**Resultados:** Se reclutaron 610 pacientes, de los que 580 fueron evaluables (edad media 70,1 (16,9) años, 45,3% mujeres). Los pacientes clasificados como de riesgo moderado o alto según PRETEMED fueron 256 (44,1%) y según PPS 368 (63,4%). Al evaluar la concordancia entre ambas escalas, se observó un índice kappa de 0,39 (IC95%: 0,32-0,46), con una discordancia del 31,3%. La incidencia de ETV en los 129 pacientes sin trombopprofilaxis clasificados de moderado o alto riesgo, según PRETEMED, fue de 2,3% y en los 201 pacientes de alto riesgo, según PPS, fue del 3,5%.

**Conclusiones:** Existe discordancia significativa entre las escalas utilizadas (PRETEMED y PPS) para valorar el riesgo de ETV en los pacientes hospitalizados por patología médica. PPS fue la que más pacientes clasificó de alto riesgo, y lo hizo mejor, en base al desarrollo posterior de ETV. [Emergencias 2014;26:349-353]

**Palabras clave:** Trombopprofilaxis. Servicios de urgencias hospitalarios. Enfermedad tromboembólica venosa.