Venous thromboembolism risk and prophylaxis in a Saudi hospital

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ABSTRACT

الأهداف: تقييم مدى التزام الأطباء بتوصيات كلية أطباء الصدر الأمريكية للوقاية من جلطة الأوردة الدموية العميقة، بالإضافة إلى تقييم عوامل الخطر المرتبطة بهذه المشكلة.

الطريقة: أجريت هذه الدراسة الاسترجاعية في مستشفى الملك عبدالعزيز، الأحساء، المملكة العربية السعودية، وذلك خلال الفترة من نوفمبر 2009م إلى ديسمبر 2009م. وقد استخدمت المبادئ التوجيهية للكلية الأميركية لأطباء الصدر عام 2008م ومقياس كابريني لتقييم مخاطر الجلطات الوريدية وتحديد ما إذا كان المرضى قد تلقوا العلاج الوقائي الموصى بها. لقد قمنا باسترجاع ملفات جميع المرضى المنومين في المستشفى الذين تتراوح أعمارهم بين 15 سنة فما فوق من أجل تقييم خطر الإصابة بالجلطات الوريدية. وقد وُضعت ورقة بيانات لرصد بيانات المرضى الديموغرافية، والدواء المُستخدم للوقاية من الجلطات، والجرعة، وطريق العلاج، والمدة، وعوامل الخطر المرتبطة بها. ويعد معدل استخدام الأدوية المناسبة للوقاية من الجلطات هو نقطة النهاية الأولية.

النتائج: شملت الدراسة ما مجموعه 968 مريض، ووصل متوسط عمر المرضى 18.7±40 عاماً، وكان 647 (66.8%) من النساء. لقد كان 547 مريضاً (56.5%) معرضاً للخطر وذلك وفقاً لمعايير الكلية الأميركية لأطباء الصدر. وقد تلقى 117 (55.7%) من المرضى شكلاً من أشكال العلاج الوقائي للجلطات الوريدية من أصل 210 مريض كانوا مؤهلين لتلقي العلاج، فيما تلقى 46 مريضاً (39.3%) العلاج حسب معايير الكلية الأميركية لأطباء الصدر. في المقابل لم يعاني 25.6% من المرضى من أي خطر على الرغم من تلقيهم علاجاً وقائياً للجلطات الوريدية وذلك وفقا لمقياس كابريني.

خاتمة: تبين هذه الدراسة أن نسبة قليلة فقط من المرضى المستحقين قد تلقوا العلاج الوقائي للجلطات الوريدية الموصى بها. وينبغي بذل الجهود المناسبة لوضع استراتيجيات من أجل تحسين تنفيذ هذه الممارسة لسلامة المرضى.

Objectives: To evaluate the risk factors and physician's compliance to American College of Chest Physicians (ACCP) guidelines recommendations for venous thromboembolism (VTE) prevention at our hospital.

Methods: This retrospective cohort study was conducted at King Abdulaziz Hospital, Al-Ahsa, Saudi Arabia from November 2009 to December 2009. We used the American College of Chest Physicians (ACCP) 2008 guidelines and Caprini's scores to assess VTE risk and to determine whether patients had received recommended prophylaxis. All hospital in-patients aged 15 years or above were assessed for risk of VTE by reviewing the hospital chart. A data sheet was developed to obtain the data on demographics, VTE prophylaxis medication, dose, route, duration, and associated risk factors. The primary endpoint was the rate of appropriate thromboprophylaxis.

Results: Nine hundred and sixty-eight patients were included. The mean age was 40±18.7 years, and 647 (66.8%) were women. According to the ACCP criteria, 547 (56.5%) patients were at risk for VTE. Of 210 patients that qualified for prophylaxis, 117 (55.7%) received some form of prophylaxis. However, 46 (39.3%) of them received ACCP-recommended VTE prophylaxis. In contrast, 25.6% of patients with no risk, according to Caprini score, had thromboprophylaxis prescribed.

Conclusion: This study demonstrates that only a small proportion of eligible patients received the recommended VTE prophylaxis. Efforts should be made to develop strategies to improve patient safety practices.

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Venous thromboembolism (VTE) is the third most common prevalent cardiovascular disorder.[1] Incidence of VTE including deep venous thrombosis (DVT) and pulmonary embolism (PE) ranges between 10-33% in hospitalized patients.[2] At least one risk factor for VTE is present in almost all hospitalized patients and up to 40% of them have 3 or more risk factors.[3] Approximately 5-10% of the in-hospital deaths are caused by PE,[4,5] making VTE the most common preventable cause of in-hospital deaths.[6] Furthermore, VTE is associated with long-term complications like recurrent DVT, post-thrombotic syndrome, and chronic thromboembolic pulmonary hypertension.[2,6,7] Randomized clinical trials provide evidence that thromboprophylaxis reduces the incidence of VTE.[4] In general medical patients, VTE occurred in 2.8-5.6% of patients receiving thromboprophylaxis compared with 5.0-14.9% of patients receiving placebo.[5-7] Evidence based guidelines for VTE prophylaxis are available since long time.[4,8] Guidelines produced by the American College of Chest Physicians (ACCP) are considered to be the 'gold standard' in VTE prevention, diagnosis and management, and have been updated in 2008.[3] However, the compliance to appropriate prophylaxis recommended by ACCP guidelines is low ranging from 13-58% in developed countries like North America,[1,6,9,10] and even lower in developing countries such as Jordan and India.[11,12] A recent multinational study published from the Middle East, found VTE prophylaxis and guidelines application low (37%).[13] This study was conducted, as part of quality improvement initiative, to evaluate the risk factors and physicians compliance to ACCP recommendations for VTE prevention at our hospital. The primary endpoint was the rate of appropriate thromboprophylaxis as determined in the ACCP guidelines.

Methods. This retrospective cohort study was conducted at King Abdulaziz Hospital (KAH), Al-Ahsa, a tertiary care hospital in the Eastern region of Kingdom of Saudi Arabia. Two risk assessment models, ACCP 2008 Guidelines[3] and the Caprini score,[14] were used to obtained data information from the medical charts.

Patients' screening. Inclusion criteria for the study were all patients aged >15 years, admitted in medical, surgical and gynecological/obstetrical wards between November 2009 and December 2009. Exclusion criteria were the children aged <15 years, patients already on anticoagulants on admission, and patients whose admitting diagnosis was VTE.

Patients' risk assessment for VTE. Risk assessment is typically carried out by 1 of 2 approaches, group risk assessment or individual risk assessment. The group risk assessment approach assigns patients to one of the broad risk categories, whereas risk is more accurately assessed in individual risk assessment by using individual risk scores.[15] The ACCP 2008 has assigned the patients in one of 3 VTE risk levels based on type of surgery, patient mobility, overall risk of bleeding, and moderate/high risk of VTE based on the presence of additional risk factors. In Caprini's model, about 40 risk factors are listed with weights of 1-5 points each. The total risk factor score then is used to group the patients into one of 4 categories (low, moderate, high, and highest risk).[14] This classification was comparable to that adopted by the ACCP[8] (low, moderate, and high risk),[3] except that patients with the highest risk were merged with the high-risk patient category. In summary, all patients were stratified for VTE and assigned risk level according to ACCP 2008 (low, moderate and high) by the use of individual risk assessment approach of Caprini's.[14] Venous thromboembolism prophylaxis regimen according to the risk stratification:[3] The patients were stratified into their corresponding risk to allow the assessment VTE prophylaxis appropriateness. Patients at low risk (total risk score = 1) are candidates for early mobilization. Patients at moderate risk (total risk score = 2) are candidates for Graduated Compression Stockings (GCS), intermittent pneumatic compression (IPC), low-dose unfractionated heparin (LDUH) twice or thrice daily, or low molecular weight heparin (LMWH). Patients at high risk (total risk score = ≥3) are candidates for GCS or IPC plus LDUH 3 times daily, LMWH, or warfarin with adjusted dose to reach the international normalized ratio (INR) of 2-3. For patients not receiving the appropriate therapy according to their risk, the unjustified therapy (agent used, dose, route, and frequency) is listed.

Therapy contraindications. In order to cover all therapy aspects, contraindications for pharmacological and mechanical treatment were also highlighted. The prophylaxis was considered contraindicated if the patient presented with or developed during hospitalization any of the following: intracranial hemorrhage, liver impairment, bleeding at hospital admission, an active peptic ulcer, bleeding disorders of a known cause. In addition, patients with peripheral vascular disease should neither receive GCS nor IPC.

Data collection. For the purpose of data abstraction from the medical chart, a data sheet was created to record the following information: demographic characteristics of the patients; diagnosis on admission; patients' risk factors for VTE; type of prophylaxis used (namely, low-molecular-weight heparin [LMWH], unfractionated heparin [UFH], warfarin, aspirin, and mechanical devices), and contraindication to prophylaxis.

Study measures. The primary endpoint was the rate of appropriate thromboprophylaxis. The thromboprophylaxis use was considered appropriate if recommended doses of pharmacologic prophylaxis regimens were prescribed in patients in whom thromboprophylaxis was indicated and had no apparent contra-indications to pharmacologic prophylaxis, or if any type of mechanical prophylaxis was prescribed in patients who had contraindications to pharmacologic prophylaxis. We also examined the proportion who have received thromboprophylaxis among patients in whom prophylaxis was not indicated (at low risk for VTE).

We calculated the rate of appropriate thromboprophylaxis by dividing the total number of appropriately treated patients by the number of patients at risk of VTE. The study's secondary endpoint was the fraction of all hospitalized patients at risk of VTE, which was calculated as the total number of patients at risk divided by the total number of discharged patients plus deaths.

Ethical considerations. This study was reviewed and approved by the Institutional Research Committee. As the data was collected retrospectively, informed consent was not needed.

Data analysis. Abstracted data were coded and entered into SPSS version 17 for analysis. Summary statistics, including frequency percentage, means and standard deviations, were calculated to summarize the data. Differences in proportions (such as risk levels) were tested using the Pearson chi-square test. Practice of VTE prophylaxis was classified as either appropriate or not appropriate. VTE prophylaxis practice was compared across risk levels (no risk, low risk, moderate risk, and high risk). P-values less than 0.05 were considered statistically significant.

Results. *Characteristics of patients at risk for VTE.*

During the study period, a total of 968 eligible patients were enrolled. The demographics of the enrolled patients are summarized in **Table 1**. Of 968 patients enrolled, 385 (40%) were surgical, 263 (27%) were medical, and 320 (33%), were obstetrics and gynecology patients. Mean body mass index was statistically insignificant (p=0.62) between surgical, medical and obstetrics and gynecology patients, while mean ages were statistically significant in surgical, medical and obstetrics and gynecology patients (p<0.001). On the basis of ACCP and Caprini's criteria, 547 (56.5%; 95% confidence interval [CI]: 53.4-59.6) patients were judged to be at risk for VTE, including 144 (37.4%; CI: 33-41) surgical patients 137 (52%; CI: 47-57) medical patients, and 266 (83.1%; CI: 79.7-86.6) obstetrics and gynecology patients (p<0.001). The risk factors for VTE in the study population are presented in **Table 2**.

Table 1 - General characteristics of patients at risk for venous thromboembolism from a tertiary care hospital in the Eastern region of Kingdom of Saudi Arabia.

Patient characteristics	Surgery (n=385)	Medicine (n=263)	Obstetrics and gynecology (n=320)	Total (n=968)
Women, n (%)	200 (52.0)	127 (48.3)	320 (100.0)	647 (66.8)
Age (years), mean±SD	39.5±18.5	52.3±21.0	29.8±6.8)	39.9±18.7
BMI, mean±SD	29.8±10.5	26.7±6.4	29.3±5.9	28.7±7.9
Patients with risk factors, n (%)	144 (37.4)	137 (52.1)	266 (83.1)	547 (56.5)

BMI- Body Mass Index, SD- Standard Deviation

Table 2 - Distribution of risk factors among the study population.

Risk factor	Surgical n=385	Medical n=263	Obstetrics and Gynecology n=320	Total n=968
Obesity	174 (45.2)	56 (21.3)	134 (41.9)	364 (37.6)
Pregnancy/ postpartum	54 (14.1)	6 (2.3)	266 (83.1)	326 (33.7)
Acute infection	23 (6.0)	44 (16.7)	7 (2.2)	74 (7.6)
ICU admission	10 (2.6)	51 (19.4)	2 (0.6)	63 (6.5)
Recent surgery	18 (4.7)	5 (1.9)	36 (11.3)	59 (6.1)
Chronic heart failure	5 (1.3)	44 (16.7)	0	49 (5.1)
Chronic pulmonary disease	10 (2.6)	32 (12.2)	5 (1.6)	47 (4.9)
Active cancer	10 (2.6)	21 (8.0)	6 (1.9)	37 (3.8)
Cancer therapy	8 (2.0)	16 (6.1)	4 (1.3)	28 (2.9)
Acute respiratory failure	2 (0.5)	21 (8.0)	2 (0.6)	25 (2.6)
Central venous catheter	4 (1.0)	18 (6.8)	0	22 (2.3)
Recent ischemic stroke	4 (1.0)	13 (5.0)	1 (0.3)	18 (1.9)
Acute inflammatory disorder	5 (1.3)	9 (3.4)	0	14 (1.4)
Contraceptives/ HRT	1 (0.3)	2 (0.8)	3 (0.9)	6 (0.6)
Previous VTE	1 (0.3)	5 (1.9)	0	6 (0.6)
Age classes (years)				
<40	233 (60.5)	74 (28.1)	299 (93.4)	606 (62.6)
41-60	95 (24.7)	70 (26.6)	21 (6.6)	186 (19.2)
>60-74	30 (7.8)	81 (30.8)	0	111 (11.5)
>75	27 (7.0)	37 (14.1)	0	64 (6.6)

Data are expressed as number and percentage (%),
HRT- hormone replacement therapy, VTE- venous thromboembolism

Table 3 - Study patients grouped according to risk levels and the use of anticoagulation (N=968).

ACCP risk level	Caprini risk factors	Admitting services	Number of patients (%)	Contraindications to prophylaxis n (%)	Patients eligible for prophylaxis n (%)	Patients received prophylaxis n (%)
No	Risk factors = 0	Medicine	126 (30.0)	4 (3.2)	NA	33 (26.1)
		Surgery	241 (57.2)	7 (2.9)	NA	67 (27.8)
		Gyne/Obstet	54 (12.8)	5 (9.2)	NA	8 (14.8)
		Total	421 (100)	16 (3.8)	NA	108 (25.6)
Low	Risk factor = 1	Medicine	22 (6.7)	5 (22.7)	NA	1 (4.5)
		Surgery	71 (21.7)	5 (7.0)	NA	6 (8.4)
		Gyne/Obstet	234 (71.6)	6 (2.6)	NA	25 (10.6)
		Total	327 (100)	16 (4.9)	NA	32 (9.7)
Moderate	Risk factors = 2	Medicine	25 (37.9)	1 (4.0)	24 (96.0)	9 (37.5)
		Surgery	28 (42.4)	1 (3.6)	27 (96.4)	10 (37)
		Gyne/Obstet	13 (19.7)	0 0	13 (100.0)	3 (23)
		Total	66 (100)	2 (3.0)	64 (96.9)	22 (34.3)
High	Risk factors = ≥3	Medicine	90 (58.4)	6 (6.6)	84 (93.3)	51 (60.7)
		Surgery	45 (29.2)	1 (2.2)	44 (97.8)	29 (65.9)
		Gyne/Obstet	19 (12.3)	1 (5.2)	18 (94.8)	15 (83.3)
		Total	154 (100)	8 (5.2)	146 (94.8)	95 (65.0)

ACCP - American College of Chest Physicians, NA - not applicable

The risk-level of all the patients and their use of prophylaxis are presented in **Table 3**. Of the 968 patients, 421 (43.5%) had no VTE risk, 327 (33.8%) were at low risk, 66 (6.8%) at moderate risk, and 154 (15.9) at high risk.

VTE prophylaxis practices. Of 220 patients that were candidates for prophylaxis, 10 were observed to have contraindications to pharmacologic prophylaxis. Of 210 patients that were eligible for prophylaxis, 117 (55.7%; CI: 50-61) received some form of prophylaxis, and 39.3% of them (n=46; 20.5% of the total) complying ACCP guidelines. Unfractionated heparin was the most commonly used form of prophylaxis, followed by the low molecular weight heparin. We found the use of mechanical VTE prophylaxis (intermittent pneumatic compression and graduated stockings) in only 11 patients with risk of VTE. Patients received ACCP-recommended VTE prophylaxis included[16] (22%; CI: 13-31) surgical patients at risk, 13 (11.3%; CI: 6-17) at risk medical patients, and 17 (53%; CI: 36-70) at risk obstetrics and gynecology patients ($p<0.001$). The inappropriate VTE prophylaxis was reported in 60% of the low-risk group, 86% of the moderate-risk group, 74% of the high-risk group. The leading reason for failure to meet ACCP 2008 criteria was no thromboprophylaxis at all (45% of at-risk patients). In contrast, (108/421) 25.6% of the patients with no risk of VTE had thromboprophylaxis prescribed.

Discussion. Venous thromboembolism is a common and preventable disease in medical and surgical wards. Our study revealed that thromboprophylaxis is grossly under utilized in medical and surgical patients. Fifty-six percent of our patient had one or more risk factors that made them eligible to receive prophylaxis, yet only 39.3% of them received appropriate prophylaxis. This rate is comparable to the rate that was found in Middle East study,[13] as well as from USA.[1] A study from Canada reported that 16% of Canadian patient received appropriate prophylaxis.[1] In Brazil, VTE prophylaxis risk assessment using Caprini's scorecard also showed a significant under-utilization of VTE prophylaxis.[16] However, in Europe the rate of using prophylaxis was better especially in France and Germany.[6] This finding could be due to many factors, including physician awareness, availability of guideline,[5] educational factors, and national health care resources. We found low prophylaxis rate in the medical patients (11.3%) compared with surgical (22%) and obstetrics and gynecology patient (53%). This is consistent with other studies that have shown low use of prophylaxis in at-risk medical patients.[10,17] The low rate of prophylaxis in medical patient can be attributed to several factors. First, the heterogeneity and complexity of medical patient that mandate more efforts and time to stratify patient risk. Second, the benefit of prophylaxis to medical patient is less perceived by physician comparing to surgical patient.[3] The study demonstrates that 57% of hospitalized patient have significant risk factors for development of VTE. These risks are often not recognized by clinicians as shown by low rate of prophylaxis. We found that obesity is the major risk factor in hospitalized patient. Thirty-seven percent of the patients in our study were obese. This can be explained by 2 reasons; first, our hospital is an

obesity treatment center and secondly, the prevalence of obesity has been found to be higher in Saudi Arabia.

Heparins were by far the most often used type of prophylaxis in medical patients, while the use of mechanical prophylaxis was very rare. While heparins were even more often used in surgical patients, only few patients received mechanical prophylaxis. All obstetrics and gynecology patients at risk received heparins. In general, proportions of the type of VTE prophylaxis used in our hospital are similar to the global data, but the use of mechanical prophylaxis is lower. Similar to the European countries,[18] low molecular weight heparins (LMWH) were the most frequent pharmacologic approach (100% of heparins used) in obstetrics and gynecology patients. The unfractionated heparin was more often used in medical and surgical patients, similar to the USA settings.[1,19] It is probably due to the fact that Obstetrics and Gynecology Department is following the European guidelines, while the USA guidelines are followed in the Departments of Medicine and Surgery.

The reasons for underutilization of thromboprophylaxis in hospitalized patient as described in literatures are: poor physician awareness, difficulty in adopting the habit of prescribing thromboprophylaxis in their clinical practice, and lack of protocols to implant the current guidelines.[1] Furthermore, administrative barrier can contribute to poor adaptation of recommended guidelines. For example, lack of medical education, information system, and pre-made hospital order forms could contribute to underutilization. The availability of electronic alert has led to an increase in thromboprophylaxis rates and may therefore be beneficial to hospitals.[17] This study on the other hand, highlights the current inappropriate use of prophylaxis in patient at no risk group. A rate of 10% of inappropriate use of prophylaxis was reported from Canada.[10] In our study, 25% of no risk patients have received some form of prophylaxis. The reason for such high rate is unclear and it is worth full to be investigated. However, incomplete physician documentation of patient data that affects most of retrospective studies, could explain why some patients who have no indication for prophylaxis have received it. Wide differences in everyday practice of VTE prophylaxis in patients deemed as being at risk suggest that, despite availability of original evidence-based consensus guidelines, the awareness of the risk of VTE in hospitalized patients is still insufficient. Efforts should be made to increase this awareness through vigorous educational actions. The development and implementation of clinical guidelines has been shown to be beneficial in increasing the VTE prophylaxis rate and reducing the rate of VTE episodes.[20,21] There are no formal guidelines, standardized order sets, computer-generated alerts, or risk-stratification tools are in place at our institution. This study highlights immediate attention on development and implementation of standardized methods of identifying patients to ensure appropriate VTE prophylaxis. Incorporation of risk assessment and stratification score for acutely ill patients, as a part of their initial management as carried out in our study could be a simple and cost-effective way of identifying patients for VTE prophylaxis. Our hospital is in the process of developing and implementing VTE prophylaxis initiatives. Future studies should prospectively assess the effectiveness of these initiatives.

Similar to the design and conduct of any retrospective study, our study has several limitations. The results of the study may not be generalized as it is conducted at a single hospital. The chances for incomplete documentation of patient data in the medical record are common to all retrospective designs. We did not include the length of stay in calculating the rate of appropriate prophylaxis, which might lead to over estimation of compliance rate. On the other hand, what make this study strong is that it is the first study in Saudi Arabia that identified the rate of appropriate utilization of thromboprophylaxis and highlighted the need to work hard in prevention before treatment.

In conclusion, we found that only a small proportion of eligible patients received the recommended VTE prophylaxis. Efforts should be made to develop strategies to improve implementation of this patient safety practice.

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