Modalities in Venous Thromboembolism Prophylaxis and Symptomatic Venous Thromboembolism Occurrence in Critically Ill Surgical Patients (THAI-SICU Study)

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Objective: *This report aimed to demonstrate the current modality of venous thrombomebolism (VTE) prophylaxis at the University-based critical, surgical care units (SICUs) and the occurrence of VTE during SICUs admission.*
Material and Method: *The data were analyzed from a multicenter prospective observational study that was conducted in 9 university based SICUs in Thailand (THAI-SICU study). VTE prophylaxis and occurrence were recorded daily and VTE events which included deep vein thrombosis (DVT) and pulmonary embolism (PE) were collected only after symptomatic events occurred and confirmed the diagnosis by Doppler ultrasonographic examination or other imaging modalities.*
Results: *A total of 385 in 4,652 cases (8.3%) received VTE prophylaxis. The modalities of VTE prophylaxis were significant difference depended on the admission diagnosis, patient age, and severity of diseases. The result of total VTE occurrence was 18 patients (0.4%) and mortality was 4 in 18 patients (22.2%). Of these, DVT occurred in 14 patients (0.3%) and mortality was 3 of 14 patients (21.4%), and the PE occurred in 4 patients (0.1%) and mortality was 1 of 4 patients (25.0%).*
Conclusion: *The VTE prophylaxis rate was low in Thai University based SICUs. Although the overall incidence of symptomatic VTE in the SICUs low, the mortality rate was high in this cohort.*

Keywords: *Venous thromboembolism, Venous thrombosis, Pulmonary embolism, Intensive care units, Complications*

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Venous thromboembolic (VTE) which includes deep vein thrombosis (DVT) and pulmonary embolism (PE) is a cause of preventable death. The incidence of DVT and PE were reported as 0.8-1.3%[1] and 0.4% of total admissions and 5-10% of the total number of medical and surgical intensive care patients[2,3]. The data in Thailand showed that the symptomatic VTE occurrence was 0.59% of hospitalized patients who were admitted for more than 3 days[4] and 10.5% of the total number of patients who were admitted in surgical intensive care units (SICUs) and had Doppler ultrasonography scanning[5].

Patients who are admitted in SICUs have predisposing factors for VTE thus VTE prophylaxis is recommended in several published reports. The ENDORSE study that collected prophylaxis data worldwide found 59% of the population was at risk and only 0.2% in Thailand had proper prophylaxis[6]. There is still a limited amount of data on VTE occurrence in Thailand and a lack of data on prophylaxis utilization in the country. This study aims to describe current VTE prophylaxis modalities and the incidence of VTE in the SICUs in Thailand.

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Material and Method

Data collection

The data were extracted for a prospective-multicenter observational study in 9 university-based SICUs in Thailand (THAI-SICU study). The data collection period was from April 2011 to January 2013. The study collected data after the patients were admitted until they were discharged or after 28 days from admission. The protocol of data collection was published previously[7]. The prophylaxis and VTE

events were recorded daily while the patients were admitted in the SICUs. Besides baseline characteristics, we also collected details in the patients who had VTE occurrence and outcomes.

Definitions

The types of prophylaxis were categorized into no prophylaxis, mechanical prophylaxis, and pharmacological prophylaxis. We did not collect contraindications of prophylaxis or categorize the risks of VTE. DVT and PE events included only symptomatic DVT and PE and the events had to develop and were confirmed while the patients were in the SICUs. The diagnosis was confirmed by ultrasonography or other imaging modalities. The DVT screen was not applied in the protocol.

The day of event was defined as the number of days after SICU admission that the patients had confirmation of VTE. The 28-day hospital mortality was calculated from day 1 of SICU admission.

Descriptive data were reported as number count, percentage, mean and standard deviation (SD) or median and interquartile range (IQR). Chi-squared or Fisher's exact probability test was used to compare independent proportion and Kruskal-Wallis test was used to compare non-parametric continuous data. Statistic significant was defined as $p<0.05$.

Results

Among 4,652 cases, the VTE prophylaxis was initiated only in 385 cases (8.3%). Mechanical prophylaxis alone was applied in 228 cases (4.9%) and pharmacological prophylaxis alone was implemented in 118 cases (2.5%). Thirty-nine patients (0.8%) had both mechanical and pharmacological prophylaxis. The prophylaxis was initiated mostly in patients who were admitted with abdominal disease, trauma, and cardiovascular disease. They were different in baseline characteristics among patients who received different prophylaxis. The utilization of the prophylaxes is shown is in Table 1.

Symptomatic VTE occurred in 18 cases (0.4%) while they were admitted in the SICUs. Fourteen cases (0.4%) had DVT and 4 cases had PE (0.1%). The characteristics of the DVT and PE patients are described in Table 2. The average age (SD) of the patients who had DVT was 67.4 (21.1) and the patients who had PE was 49.3 (22.8). Hypertension and malignancy were the most common concomitant underlying diseases. Eighty-five percent of the patients who had DVT had it in the first week. The rest of them had it on days 14 and 20. The median number of days of DVT occurrence was 1.5 days (IQR 1.0-3.7). All of the PE cases were diagnosed on the first day of SICU admission. The 28-day hospital mortality of DVT and PE patients were

Table 1. Utilization of mechanical and pharmacological prophylaxes

	Mechanical prophylaxis alone (n = 228)	Pharmacological prophylaxis alone (n = 118)	Both prophylaxis (n = 39)	No prophylaxis (n = 4,267)	*p*-value
Male	149 (65.4)	61 (51.7)	20 (51.3)	2,498 (58.6)	0.058
Median age (IQR)	53.5 (39-72)	69 (54-77)	59 (41-74)	65 (52-75)	<0.001
Median APACHE II (IQR)	10 (6.8-16)	12 (9-16)	8 (6-13)	10 (7-15)	0.016
Admission diagnosis					
Abdomen (GI-HBP)	102 (44.7)	24 (20.3)	9 (23.1)	1,734 (40.6)	<0.001
Trauma	49 (21.5)	3 (2.5)	6 (15.4)	269 (6.3)	
Neuro/Head/Neck	23 (10.1)	2 (1.7)	10 (25.6)	201 (4.7)	
Cardiovascular disease	20 (8.8)	59 (50)	4 (10.3)	656 (15.4)	
Sepsis	10 (4.4)	4 (3.4)	1 (2.6)	157 (3.7)	
Renal-GU	9 (3.9)	2 (1.7)	2 (5.1)	360 (8.4)	
Respiratory disease	9 (3.9)	11 (9.3)	1 (2.6)	340 (8)	
Musculoskeletal/Skin	3 (1.3)	9 (7.6)	4 (10.3)	294 (6.9)	
Thromboembolic events					
Deep venous thrombosis	0	9 (7.6)	2 (5.1)	3 (0.1)	<0.001
Pulmonary emboli	1 (0.4)	0	0	3 (0.1)	0.290

IQR = interquartile rank; APACHE II score = the acute physiology and chronic health evaluation II score; GI-HBP = gastrointestinal hepatobiliary and pancreas disease; Renal-GU = renal and genitourinary disease

Table 2. Characteristics of the deep venous thrombosis and pulmonary embolism patients

Gender	Age	APACHE II	Diagnosis	Underlying disease	Prophylaxis modality	Detected date after admission	ICU LOS (days)	ICU discharge status
The patients who had DVT								
1) Female	95	13	Non-traumatic amputation	HT, Cardio	Pharmacological	1	2	Alive
2) Female	51	9	Ovarian tumor	CA	Pharmacological	2	5	Alive
3) Female	23	6	Pelvic surgery	Vas, CA	Pharmacological	1	1	Alive
4) Female	93	20	Femur fracture	Stroke	Pharmacological	4	10	Alive
5) Female	79	24	Alteration of conscious	HT, DM, CA	Pharmacological	1	16	Alive
6) Male	72	24	GI cancer	HT,Cardio, CRF	Pharmacological	1	1	Alive
7) Male	61	18	Soft tissue infection	HT, DM, CRF	Pharmacological	5	6	Alive
8) Female	74	18	Neurological disease	HT, DM	Both modalities	3	28	Alive
9) Female	77	7	Pulmonary embolism	HT	Pharmacological	2	2	Alive
10) Male	81	10	Gut obstruction	HT, COPD, CA	Pharmacological	1	1	Alive
11) Male	73	29	Diverticular disease	HT, Vas, CRF, CA	No prophylaxis	1	6	Death
12) Male	32	20	Liver injury	-	Both modalities	20	28	Alive
13) Male	53	13	Pancreatic tumor	CA	No prophylaxis	1	3	Death
14) Male	79	14	AAA	COPD	No prophylaxis	14	18	Death
The patients who had PE								
15) Female	78	14	Femur fracture	HT	No prophylaxis	1	4	Alive
16) Male	29	9	Hepatoma	CA	No prophylaxis	1	2	Death
17) Female	33	16	Pulmonary embolism	CA	Mechanical	1	5	Alive
18) Female	57	9	Spinal stenosis	HT	No prophylaxis	1	4	Alive

APACHE II score = acute physiology and chronic health evaluation II score; VTE = venous thromboembolism; DVT = deep vein thrombosis; HT = hypertension; Cardio = cardiovascular disease; CA = malignancy; Vas = vascular disease; DM = diabetes mellitus; CRF = chronic renal failure; COPD = chronic obstructive pulmonary disease; PE = pulmonary embolism

3 in 14 patients (21.4%) and 1 in 4 patients (25%), respectively.

Discussion

The number of patients who had DVT in our study was much lower than previous studies that used ultrasonography to screen the patients in the SICUs in Thailand[5,8]. Their prevalence of DVT was reported as 3.6-10.5%; however, our incidence of symptomatic DVT in this study was 0.3%. This huge difference possibly was caused from the no screening policy in this study; therefore, all of the DVT patients in this study were symptomatic while most of DVT cases in SICU were asymptomatic. The study from Prichayudh et al[8] was conducted in the patients without chemoprophylaxis and also used ultrasonography screening which possibly made the incidence of VTE higher than ours. When compared with another prospective observational study conducted in a medical ward, they found the incidence of VTE was 0.59%, which was very close to our study[4].

The rate of VTE prophylaxis in the SICUs in Thailand was better than previous studies. In our study, 8.3% of the patients received any kinds of VTE prophylaxis, compared with the ENDORSE study which reported 0.6% of surgical patients who had any type VTE prophylaxis and 0.2% who had prophylaxis according to the American College of Chest Physician recommendations[6]. When compared with another study from Wilasrusmee et al that was done in critically ill surgical patients as in our study, no VTE prophylaxis was given to the patients[5]. The prophylaxis that was given in our study was utilized mostly in the patients who were admitted due to abdominal disease, vascular disease, and trauma which were populations at risk for VTE[9]. However, pharmacological prophylaxis was less utilized in the trauma population which was probably from the concern of bleeding.

Most of the patients who had DVT received a prophylaxis. An ineffectiveness of the prophylaxis was possibly caused by many reasons that we did not investigate, for instance, the compliance to the prophylaxis or the dosage of the pharmacological prophylaxis.

The main limitation of this study was the reported incidence of VTE may not reflect the true incidence of DVT due to under-reporting from the non-screening policy as discussed previously so the incidence of DVT in this study covered only symptomatic DVT. Another limitation is most of VTE cases occurred on the first day of the admission. These patients probably had VTE before admission and which was confirmed in the SICU. So we cannot report the effectiveness of VTE prophylaxis in the SICU.

Conclusion

The incidence of symptomatic VTE in SICUs was not high. However, it does not reflect the true incidence of VTE. In addition, the mortality of these patients was high. A prophylaxis was increasingly used when compared with previous literature in Thailand and was applied mostly in patients who had abdominal disease, cardiovascular disease, and trauma.

What is already known on this topic?

The incidence of DVT in surgical critically ill patients has been reported before by ultrasonography screening method which more sensitive to detect DVT when compared with our study that collected only symptomatic VTE.

What this study adds?

The last report of VTE prophylaxis used in Thailand was a decade and it showed very low number for patients who received a prophylaxis. This study reported data about current situation about VTE prophylaxis in SICUs in Thailand.

The THAI-SICU STUDY were listed

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Potential conflicts of interest

None.

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วิธีการป้องกันภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำและอุบัติการณ์ในผู้ป่วยวิกฤตศัลยกรรม (THAI-SICU study)

โอสรี อัครบวร, กวีศักดิ์ จิตตวัฒนรัตน์, สุนิสา ฉัตรมงคลชาติ, ชณัฐี กิจศิริพันธ์, กลุ่มศึกษา THAI-SICU

วัตถุประสงค์: *ภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำเป็นภาวะแทรกซ้อนที่พบได้บ่อยในผู้ป่วยวิกฤต การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาถึงการใช้การป้องกันภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำ และอัตราการเกิดภาวะแทรกซ้อนในหออภิบาลผู้ป่วยหนักทางศัลยกรรม*

วัสดุและวิธีการ: *การศึกษานี้เป็นการนำข้อมูลจากการศึกษาแบบสังเกตไปข้างหน้าในหออภิบาลผู้ป่วยหนักทางศัลยกรรมในโรงพยาบาลมหาวิทยาลัยจำนวน 9 แห่ง (THAI-SICU) มาวิเคราะห์ โดยระหว่างการเก็บข้อมูลจะมีการบันทึกภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำ ซึ่งรวมภาวะหลอดเลือดดำมีลิ่มเลือดและลิ่มเลือดหลุดอุดหลอดเลือดปอด และการใช้การป้องกันภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำเป็นประจำทุกวัน ภาวะลิ่มเลือดหลุดอุดหลอดเลือด ในการศึกษานี้ได้กำหนดเฉพาะผู้ป่วยที่มีอาการและมีการตรวจยืนยันด้วยภาพรังสี*

ผลการศึกษา: *ผู้ป่วย 385 รายจากทั้งหมด 4,652 ราย (ร้อยละ 8.3) ได้รับการป้องกันภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำ โดยวิธีการป้องกันภาวะดังกล่าวมีความแตกต่างกันอย่างมีนัยสำคัญในเรื่องการวินิจฉัยโรค อายุของผู้ป่วยและความรุนแรงของโรค โดยภาวะลิ่มเลือดหลุดอุดหลอดเลือดทั้งหมดจำนวน 18 ราย (ร้อยละ 0.4) และเสียชีวิต 4 ใน 18 ราย (ร้อยละ 22.2) ผู้ป่วย 14 รายมีภาวะหลอดเลือดดำมีลิ่มเลือด (ร้อยละ 0.3) และเสียชีวิตจำนวน 3 ใน 14 ราย (ร้อยละ 21.4) ผู้ป่วยจำนวน 4 รายมีภาวะลิ่มเลือดหลุดอุดหลอดเลือดปอด (ร้อยละ 0.1) และเสียชีวิต 1 ใน 4 ราย (ร้อยละ 25)*

สรุป: *การใช้การป้องกันภาวะลิ่มเลือดหลุดอุดหลอดเลือดดำในหออภิบาลผู้ป่วยหนักทางศัลยกรรมน้อย*