

# Knowledge and Attitudes of Venous Thromboembolism for Surgeons in Two Saudi Arabian Medical Centers

Mariam Alameri<sup>1\*</sup>, Syed Azhar Sulaiman<sup>2,3</sup>, Abdullah Ashour<sup>4-6</sup>, Ma'ad Al-Saati<sup>7-9</sup>

<sup>1</sup>Department of Clinical Pharmacy, School of Pharmaceutical Science, Universiti Sains Malaysia (USM) Penang, Malaysia. <sup>2</sup> Director of the advanced medical and dental institute, Universiti Sains Malaysia. <sup>3</sup> Institut Perubatan dan Pergigian Termaju, Universiti Sains Malaysia, Bertam, 13200 Kepala Batas, Pulau Pinang, Malaysia. <sup>4</sup> Deputy Director, Director of Residency Training Programme. <sup>5</sup> Division Head and Consultant of Arthroplasty and Adult Reconstructive Surgery. <sup>6</sup> Orthopaedics Department, Prince Sultan Military Medical City. <sup>7</sup> King Abdullah bin Abdulaziz University Hospital, Princess Nourah Bint Abdulrahman University. Vice President of Saati Medical Center Saudi Arabia Riyadh. <sup>8</sup> Consultant Orthopedic Surgeon and Sports Medicine. <sup>9</sup> Chairmen of the Orthopedic Department.

## Abstract

**Background:** Venous thromboembolism (VTE) is one of the most prevalent medical issues. Pulmonary embolism (PE) is its most common complication. Objective: The goal of this investigation was to evaluate the knowledge and attitude of surgeons regarding VTE risk factors and prophylaxis. **Method:** This was a cross-sectional research, in which the survey was distributed randomly among all surgeons in the surgical departments at two medical institutions in Saudi Arabia between the period of October 2018 and April 2019. **Results:** 172 surgeons participated in this research with a response rate of 86% (172/200). 90.7% of the respondent surgeons were male. The mean score of knowledge was revealed to be  $8.68 \pm 1.47$  out of 10 (86.8%) and that of attitude was  $12.64 \pm 1.53$  out of 15 (84.27%). **Discussion:** Both knowledge and attitude score percentages were revealed to be higher than 75% which was the minimally acceptable level. Accordingly, surgeons in both medical centers achieved an acceptable level of knowledge and a good attitude. **Conclusion:** In conclusion, the surgeons' VTE knowledge and attitude were acceptable in both medical institutions, where residents score the least scores, demonstrating the necessity for education and awareness programs regarding VTE risk factors and prophylaxis.

**Keywords:** Venous thromboembolism (VTE), Surgeons, Knowledge, Attitude, Awareness

## INTRODUCTION

Venous thromboembolism (VTE) is one of the most prevalent medical issues. Pulmonary embolism (PE) is its most common complication. Patients are predisposed to venous thrombosis if they fulfill the elements of Virchow's triad (venous stasis, endothelial injury, and hypercoagulability) reported by Rudolf Virchow, a German pathologist, in 1856<sup>[1]</sup>. Venous stasis happens secondary to long periods of immobilization in the operating room and restricted, delayed, or impaired postoperative ambulation. Endothelial injury can occur due to either a direct injury to the deep veins or the nearby tissue of the lower extremities or indirectly by a thermal injury or hematoma<sup>[2]</sup>. The annual occurrence of VTE in the US is expected to be 350,000- 900,000 of which almost 100,000 die. Of those that survive, 30-50% will go on to develop post-thrombotic syndrome and as high as 30% will develop a second deep vein thrombosis (DVT) within 5 years<sup>[3]</sup>. Surgeon consciousness of VTE symptoms, risk factors, prophylaxis and treatment are vital and crucial for any medical institution. The goal of this investigation was to evaluate the knowledge and attitude of a surgeon regarding VTE risk factors and prophylaxis.

## METHOD:

This was a cross-sectional research, in which the survey was distributed randomly among all surgeons in the surgical departments in each of the involved medical institutions between the period of October 2018 and April 2019. Two medical institutions were involved namely Prince Sultan Military Medical City (PSMMC) known as Riyadh Armed

**Address for correspondence:** Mariam Alameri, Department of Clinical Pharmacy, School of Pharmaceutical Science, Universiti Sains Malaysia (USM) Penang, Malaysia.  
E-mail: m\_alamiri15@yahoo.com

This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work noncommercially, as long as the author is credited and the new creations are licensed under the identical terms.

**How to cite this article:** Alameri, M., Sulaiman, S. A., Ashour, A., Al-Saati, M. Knowledge and Attitudes of Venous Thromboembolism for Surgeons in Two Saudi Arabian Medical Centers. Arch Pharma Pract 2019;10(3):107-11.

Forces Hospital situated in Riyadh, which is considered one of the most advanced medical centers in the Middle East with a capacity of about 1200 beds, accredited by the Joint Commission International, and King Abd Allah University Hospital (KAAUH) which is situated in the southern area of Princess Noura University (PNU) Campus, a 300-bed teaching hospital serving PNU faculty, students and community. This Survey was adapted from two studies [4, 5]. The survey contained three parts; part 1: demographic data containing 4 items; part 2: assessment of the surgeon's knowledge containing 10 items, and these items were scored from 0 to 10, in which 10 represents 100% of knowledge; part 3: evaluation of surgeon's attitude containing 3 items, and these items are scored from 3 to 15, where 15 represents 100% of the best attitude. In this investigation, 75% was considered an acceptable level for both knowledge and attitude. Face validity, content validity, and criterion validity were performed as a pre-test for this questionnaire, then the researcher distributed the instrument among 10 respondents, in order to gather their comments, and check the consistency in their responses. After all the necessary changes based on pre-test results were done, the researcher distributed the questionnaire to collect a minimum of 50 responses to be able to run the reliability measure. The value of Cronbach's alpha (after deleting some items) was 0.813, demonstrating that the questionnaire was measuring what it's expected to measure.

## RESULTS:

200 questionnaires were distributed in both centers, 172 were retrieved with a response rate of 86% (172/200). Table 1 indicates the findings of the demographic analysis of 172 surgeons. 90.7% of the surgeons in the survey were male and only 9.3% were female. 66.86% of surgeons aged between 30 and 45 years, 6.4% were below 30 years of age, 23.84% aged between 45 and 60 years, and only 3.91% of surgeons were above 60 years. In the present survey, 74.42%, 16.86%, 2.91% were orthopedic surgeons, general surgeons, and urologists, respectively. Based on qualifications, 41.86% of surgeons were specialists in their field, 36.05% were consultants, 10.47% were senior residents, and 11.63% were junior residents.

**Table 1: Frequency Analysis of Demographic Characteristics.**

Gender	N	Percentage
Male	156	90.70%
Female	16	9.30%
Age		
Less than 30 years	11	6.40%
30-Less than 45 years	115	66.86%
45-less than 60 years	41	23.84%
60 years and above	5	2.91%
Specialization		
General Surgeon	29	16.86%
Orthopedic Surgeon	128	74.42%

Thoracic Surgeon	10	5.81%
Urologist	5	2.91%
Qualification		
Consultant	62	36.05%
Specialist	72	41.86%
Senior Resident	18	10.47%
Junior Resident	20	11.63%

N= number of respondents

Table 2 depicts the findings of the frequency analysis of the knowledge of surgeons. For the first question about which have more likelihood for DVT risk, 85.47% of surgeons responded that subjects with more than 40 years of age have more probability of DVT risk. For the second question about risk factors for DVT, 87.79% reported that general anesthesia with more than 30-minute duration enhanced DVT risk. For the third question, 87.79% of surgeons considered stasis, hypercoagulability, and vascular injury as the key mechanisms for DVT risk during surgery. 94% of surgeons think that DVT is the most prevalent source of pulmonary embolism. 88.37% of surgeons considered surgery duration with less than 30 minutes is not a risk factor for DVT. For the question "Which one of the following statements reflects the outcome of DVT without treatment?", 89.53% of surgeons considered all the three outcomes of DVT without treatment (listed in table 2). 86.05% considered "Warfarin with INR of 2.5-3" not appropriate for DVT prophylaxis during surgery. 96.51% of surgeons believed that the selection of DVT preventive measures can be determined by both the number of risk factors and the type of surgery. In pulmonary thromboembolism, 7.56% found normal chest X-ray as not an accurate diagnosis, 2.91% supposed DVT is not the common source, and 82% said the most common cause of cyanosis in surgery is not accurate in pulmonary thromboembolism. The last question of the knowledge section of surgeons was "Diagnosis and beginning of therapy for pulmonary thromboembolism is based on", and 70.35%, 21.51%, and 8.14% believed respectively clinical suspicious, clinical criteria, and sophisticated imaging are enough for diagnosing and initial therapy for pulmonary thromboembolism.

**Table 2: Frequency Analysis of the "knowledge of surgeons" section.**

Questions	N	Percentage
<b>1. Which one of the following variables had more probability of risk for DVT?</b>		
Males	5	2.91%
Females	18	10.47%
A person less than 30 years old	2	1.16%
A person more than 40 years old	147	85.47%
<b>2. Which one is correct?</b>		
Any duration for general anesthesia increased risk of DVT	16	9.30%

General anesthesia only in abdominal or pelvic surgery raised the risk of DVT	5	2.91%
General anesthesia with more than 30-minute duration increased DVT risk	151	87.79%
<b>3. What is the most important mechanism or mechanisms of DVT risk during surgery?</b>		
Hypercoagulability	5	2.91%
Stasis	15	8.72%
Vascular injury	1	0.58%
All of them	151	87.79%
<b>4. Which one is correct?</b>		
Calf DVT had a 40% probability of pulmonary embolism.	10	5.81%
DVT is the most common source of pulmonary embolism.	162	94.19%
<b>5. Which one is not a risk factor of DVT?</b>		
Cardiac failure	4	2.33%
Peripartum state	5	2.91%
OCP consumption	11	6.40%
Surgery duration with less than 30 minute	152	88.37%
<b>6. Which one of the following statements reflects the outcome of DVT without treatment?</b>		
Proximal extension	4	2.33%
Limitation by fibrinolysis or organization in calf DVT	10	5.81%
Embolization risk increased	4	2.33%
All of the above	154	89.53%
<b>7. Which one is not applicable for DVT prophylaxis during surgery?</b>		
Intermittent pneumatic compression	5	2.91%
Low dose heparin	14	8.14%
Warfarin with INR of 2.5-3	148	86.05%
Elastic stocking	5	2.91%
<b>8. Selection of DVT preventive measures determined by</b>		
Number of risk factors	5	2.91%
type of anesthetic drug	1	0.58%
a and b (a. Number of risk factors b. Type of surgery)	166	96.51%
<b>9. In pulmonary thromboembolism, which one is not correct?</b>		
The most common cause of preventable mortality in hospital	13	7.56%
DVT is the most common source	5	2.91%
The most common cause of cyanosis in surgery	141	81.98%
Most of them have normal chest X-ray	13	7.56%
<b>10. Diagnosis and beginning of therapy for pulmonary thromboembolism is based on</b>		

Clinical criteria	37	21.51%
Sophisticated imaging	14	8.14%
Clinical suspicious is enough	121	70.35%

DVT= Deep Vein Thrombosis, OCP =oral contraceptive pill, N= number of respondents

For the attitude questions are shown in **Table 3**, cumulatively, around 95% of surgeons considered that sensitive and objective test is necessary for DVT screening in post-surgical patients. 2.91% of surgeons considered it less important for the detection of DVT risk factors prior to surgery, 13.37% considered it as average, and 32.56% consider it highly recommended, and 51.16% recommended it very highly to detect DVT risk prior to surgery. 95% of surgeons (25.58%+69.19%) thought DVT prevention very necessary in surgery.

**Table 3: Frequency Analysis of “ Evaluation of Surgeons’ Attitude” Section.**

Questions	N	Percentage
<b>1. How much you know the sensitive and objective tests (Doppler sonography) necessary for DVT Screening in post-surgical patients?</b>		
Average	6	3.49%
High	44	25.58%
Very high	119	69.19%
<b>2. How much detection of DVT risk factors is necessary prior to surgery?</b>		
Low	5	2.91%
Average	23	13.37%
High	56	32.56%
Very high	88	51.16%
<b>3. How much DVT prevention is necessary for surgery?</b>		
Average	6	3.49%
High	44	25.58%
Very high	119	69.19%

DVT= Deep Vein Thrombosis, N= number of respondents

Table 4 shows the results of the regression analysis for the scores evaluated from the knowledge of the surgeons. It was assumed that age, gender, specialization, and qualification have no impact on scores of knowledge of surgeons. The p-value of individual t-test was significant (p-value<0.05) for gender, specialization, and qualification and insignificant (p-value>0.05) for age. The value of R-square for this model was 0.419 indicating that 41.9% variability in scores of knowledge of surgeons was due to their age, gender, qualification, and specialization and 58.1% was due to other factors.

**Table 4:** Regression for scores of knowledge of surgeons

Model	Estimates	t-statistic	P-value
<b>Intercept</b>	13.6178	17.3659	0.0000
<b>Age</b>	0.0448	0.2425	0.8087
<b>Gender</b>	-0.9840	-3.0602	0.0026
<b>Specialization</b>	-1.3467	-8.4710	0.0000
<b>Qualification</b>	-0.6745	-6.0783	0.0000

Table 5 presents the results of regression analysis for the impact of age, gender, specialization, and qualification on scores of attitudes of surgeons. The P-value of the t-test was low for gender and qualification (P-value < 0.05) and high for the age and specialization (p-value > 0.05). A significant p-value of gender and qualification showed that gender had an impact on the surgeon's attitude. Similarly, being a consultant, specialist, senior, or junior resident also had an impact on the attitude of surgeons. The value of R-square for this model was 0.25 indicating that 25% variability in the scores of attitudes of surgeons towards surgery was due to age, gender, specialization, and qualification and 75% was due to other factors.

**Table 5:** Regression for scores of attitudes of surgeons.

Model	Estimates	t-statistic	P-value
<b>Intercept</b>	16.1882	17.4574	0.0000
<b>Age</b>	-0.1361	-0.6235	0.5338
<b>Gender</b>	-1.7381	-4.5711	0.0026
<b>Specialization</b>	-0.0861	-0.4578	0.6477
<b>Qualification</b>	-0.5956	-4.5390	0.0000

Table 6 presents the correlation analysis of the demographic characteristics of surgeons with their scores of knowledge and attitude. Age and scores of knowledge had a positive but weak relationship which indicates that the increase in age had an increasing relation with scores of knowledge and scores of attitudes of surgeons. The value of correlation for qualification with both scores was negative indicating that from consultant (1) to junior residents (4), the value of both scores decreased. The value of scores of knowledge and specialization of surgeons was also negative showing more knowledge scores for DVT risk by general surgeons and fewer scores of knowledge by orthopedic surgeons. Gender also had a negative relationship with both types of scores showing more scores for males and fewer scores for females.

**Table 6:** Correlation of demographic characteristics of surgeons with their scores of knowledge and attitude.

Demographic Characteristics	Scores of Knowledge	Scores of Attitude
<b>Age</b>	0.1943	0.2547
<b>Gender</b>	-0.109	-0.3693

<b>Specialization</b>	-0.4003	0.1158
<b>Qualification</b>	-0.4045	-0.3963

Table 7 presents the results of the two-sample t-test assuming equal variances. The mean score of knowledge was found to be  $8.68 \pm 1.47$  and that of attitude was  $12.64 \pm 1.53$ . The percentage represents the mean value contribution out of total scores of knowledge and attitude respectively. Minimum scores in knowledge and attitude were 5 and 8 respectively while maximum scores being 10 and 15 for both types of scores.

**Table 7:** Comparison of two types of scores.

Measures	Scores of knowledge	Scores of Attitude	P-value
<b>Mean</b>	8.68	12.64	0.000
<b>percentage</b>	86.8%	84.27%	
<b>Minimum</b>	5	8	
<b>Maximum</b>	10	15	
<b>SD</b>	1.47	1.53	

SD = Standard deviation

## DISCUSSION

As it's clear from the results, most of our respondents were males (90.70%), indicating that female surgeons in both medical centers were of low numbers. The mean score of knowledge was 8.68 out of 10, with a percentage of 86.8%, and the mean score of attitude was 12.64, with a percentage of 84.27%. Both knowledge and attitude score percentages were higher than 75%, accordingly, surgeons in both medical centers achieved an acceptable level of knowledge and a good attitude. Depending on regression and correlation analysis of demographic characteristics of surgeons with their scores of knowledge and attitude, higher scores were associated with a higher level of qualification, where consultants achieved the highest scores in both medical centers, and junior residents achieved the least scores in the involved medical centers. Additionally, higher scores were achieved by general surgeons more than the orthopedic surgeons, likewise, male surgeons score higher scores than female surgeons. Since the least scores were recorded by the junior and senior residents, the authors recommend arranging educational and awareness programs regarding VTE risk factors and prophylaxis for these resident physicians to enhance their level of VTE awareness and knowledge.

## CONCLUSION

This was a cross-sectional study that assessed the knowledge and attitude of the surgeon regarding VTE risk factors and prophylaxis. In both medical centers, the surgeons achieved an acceptable level of VTE knowledge and best attitude, where residents scored the least scores, indicating the need for education and awareness programs regarding VTE risk factors and prophylaxis.

## List of Abbreviations

VTE	Venous thromboembolism
PE	Pulmonary embolism
DVT	Deep vein thrombosis
PSMMC	Prince Sultan Military Medical City
KAAUH	King Abd Allah University Hospital
PNU	Princess Noura University
INR	International normalized ratio

## Declarations

### Consent for publication

All authors agreed on publication for this work (see the enclosed supporting data).

### Competing interests

None to declare.

### Funding

None to declare.

### Authors' contributions

All authors have made *substantial contributions to all three sections (1), (2), and (3) below*:

- 1) The conception and design of the study, or acquisition of data, or analysis and interpretation of data
- 2) Drafting the article and revising it critically for important intellectual content
- 3) Final approval of the version to be submitted

Corresponding author: Mariam Ahmad Alameri



## ACKNOWLEDGMENTS

The authors would like to gratefully acknowledge all surgeons at the surgical departments in both medical centers and a special thank for Dr. Marwan Mostafa El-Shal, an associate consultant orthopedic at Prince Sultan Military Medical City, and Dr. Mohamed Ahmed Noaman ElRaei, an associate consultant orthopedic at King Abdullah bin Abdulaziz University Hospital for their cooperation and attention.

## REFERENCES

1. Byrnes JR, Wolberg AS. New findings on venous thrombogenesis. *Hämostaseologie*. 2017;37(01):25-35.
2. Haake DA, Berkman SA. Venous thromboembolic disease after hip surgery. Risk factors, prophylaxis, and diagnosis. *Clinical orthopaedics and related research*. 1989 May(242):212-31.
3. Streiff MB, Brady PJ, Grant AM, Grosse SD, Wong B, Popovic T. CDC Grand Rounds: preventing hospital-associated venous thromboembolism. *MMWR. Morbidity and mortality weekly report*. 2014 Mar 7;63(9):190.
4. Zobeiri M, Najafi F. Prophylaxis for deep venous thrombosis: Knowledge and practice of surgeons. *Pakistan Journal of Medical Sciences*, 2011; 27(1), 16-20.
5. Gao F, Kause J. Thromboprophylaxis awareness among hospital staff. *British Journal of Nursing*. 2010 Oct 14;19(18):1175-8.