KNOWLEDGE, ATTITUDE AND PRACTICE OF VENOUS THROMBOEMBOLISM PROPHYLAXIS AMONG DOCTORS AND NURSES IN A TERTIARY TEACHING HOSPITAL IN KELANTAN

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Never forgetting Lord Ganesha for the many blessings, he has bestowed upon me in all my life and the good health that were necessary in completing this thesis.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF ABBREVIATIONS

ACCP	American College of Chest Physicians
ASH	American Society of Haematology
AT9	Antithrombotic Therapy and Prevention of Thrombosis, 9th edition: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines
DVT	Deep Vein Thrombosis
GCS	Graduated Compression Stockings
ICU	Intensive Care Unit
IPC	Intermittent Pneumatic Compression Devices
KAP	Knowledge, Attitude and Practice
LMWH	Low Molecular Weight Heparin
MOH	Ministry of Health
NICE	National Institute of Health Care and Excellence
OECD	Organisation for Economic Co-operation and Development
PE	Pulmonary Embolism
RAM	Risk Assessment Model
UFH	Unfractionated Heparin
USM	Universiti Sains Malaysia
VTE	Venous thromboembolism

PENGETAHUAN, SIKAP DAN AMALAN PROFILAKSIS TROMBOEMBOLISME VENA DI KALANGAN DOKTOR DAN JURURAWAT DI HOSPITAL PENGAJAR TERTIARI DI KELANTAN

ABSTRAK

Latar belakang: Tromboembolisme vena (TEV) adalah punca utama kematian di hospital yang boleh dielakkan. Ia adalah penting bagi kakitangan perubatan untuk memahami tentang kepentingan profilaksis TEV kerana ia boleh mengurangkan beban penyakit ini. **Objektif:** Menilai pengetahuan, sikap dan amalan terhadap pencegahan TEV dalam kalangan doktor dan jururawat di Hospital Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan, Malaysia. **Kaedah Kajian:** Kajian keratan rentas telah dijalankan dari Mei hingga Ogos 2022 di Hospital USM, Kubang Kerian, Kelantan, Malaysia. Data dikumpul dengan menyebarkan borang kaji selidik yang telah disahkan secara atas talian yang diberikan kepada doctor dan jururawat melalui WhatsApp dan email. Data dianalisa dengan perisian SPSS versi 26. **Keputusan:** Kajian ini disertai oleh 331 doktor dan jururawat. Tahap pengetahuan, sikap dan amalan terhadap pencegahan TEV adalah sangat baik adalah masing-masing 92.4%, 78.5% dan 78.5%. Responden daripada Jabatan Perubatan Dalam,

Pembedahan dan Orthopedik berbanding jabatan- jabatan lain menujukkan kaitan yang signifikan dengan tahap pengetahuan yang bagus. Terdapat kaitan yang signifikan antara jangka masa kerja melebihi 10 tahun, tahap pendidikan dan dengan tahap amalan yang bagus. Khuatir akan pendarahan adalah halangan amalan yang paling biasa yang dirasakan oleh responden (83.7%) dalam mengamal profilaksis TEV. **Kesimpulan:** Hasil kajian ini menunjukkan tahap pengetahuan, sikap dan amalan yang baik dalam kalangan doktor dan jururawat terhadap pelaksanaan pencegahan TEV. Pendidikan berkenaan TEV dan pencegahannya perlu diperkenalkan di kalangan para doktor dan jururawat. Di samping itu, pembentukkan polisi hospital akan membantu para doktor dan jururawat untuk lebih peka tentang isu ini.

KNOWLEDGE, ATTITUDE AND PRACTICE OF VENOUS THROMBOEMBOLISM PROPHYLAXIS AMONG DOCTORS AND NURSES IN A TERTIARY TEACHING HOSPITAL IN KELANTAN

ABSTRACT

Background: Venous thromboembolism (VTE) is a leading cause of preventable hospital mortality. It is important for healthcare providers to understand the importance of VTE prophylaxis as it may reduce the burden of this disease. **Objective:** Assessment of knowledge, attitude and practice among doctors and nurses in Hospital Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan, Malaysia. **Methods:** A cross-sectional study was conducted from May to August 2022 at Hospital USM, Kubang Kerian, Kelantan, Malaysia. Data was collected using online validated questionnaires administered to doctors and nurses via WhatsApp and e-mail. The data was analysed by using SPSS software version 26. **Results:** The study was participated by 331 doctors and nurses. Good level of knowledge, attitude and practice of VTE were 92.4%, 78.5% and 78.5% respectively. Respondents from Internal Medicine, General surgery and Orthopaedics departments showed significant association with good knowledge and attitude. There are significant

association between a working duration of more than 10 years and education level with good practice. Fear of bleeding was the most common practice barriers perceived by respondents (83.7%) in providing VTE prophylaxis. **Conclusion:** The results of this study show a good level of knowledge, attitude and practice among doctors and nurses regarding the implementation of VTE prevention. Education based on VTE and its prevention needs to be introduced to doctors and nurses. In addition, the formation of hospital policies will help doctors and nurses to be more sensitive about this issue.

CHAPTER 1

INTRODUCTION

1.1 Background

Venous thromboembolism (VTE) refers to occlusion within the venous system by a blood clot, which may or may not become dislodged from its site of origin and encompasses both deep vein thrombosis (DVT) and its most dangerous complication, pulmonary embolism (PE). VTE is a major health problem (American Society of Hematology, 2019). It is the third most common cardiovascular disease after myocardial infarction and stroke in the world. The overall VTE rates are 100 per 100,000 populations per year, of which 70% are hospital acquired (Ministry of Health Malaysia, 2013). Between 1 and 3% of patients admitted to hospital will suffer a complication of VTE during hospitalization, and many have increased risk after hospital discharge. The total burden of VTE from hospitalized medical patients is substantial estimating 25–30% of all VTE in the United States is related to medical hospitalization (Nicholson et al., 2020).

It has long been perceived that VTE is rare in Asia. However, several recent epidemiological studies seem to refute this (Liew NC et al., 2017). Nine studies of Asian hospital registries or databases reported VTE rates ranging from 11 to 88 cases per 10,000 admissions (Lee et al., 2017). These numbers show that the burden of VTE is still high and VTE prophylaxis is still not being emphasized appropriately.

1.2 Risk Factors for VTE

Risk factors for VTE can be subdivided into factors that promote venous stasis, factors that promote blood hypercoagulability, and factors causing endothelial injury or inflammation (Elias et al., 2017). These three broad categories, frequently taught as “Virchow’s triad”, have formed the basis for understanding and categorizing the risk factors of VTE for over a century. A clear understanding of the risk factors for VTE is vital to identify patients at risk of VTE who would benefit from thromboprophylaxis (Salahuddin, 2017). Risk factors for the development of VTE include (among others) increased age, intensive care admission, hormone replacement therapy, cancer, and other comorbidities including cardiovascular, renal, and respiratory diseases., pregnancy and post trauma or surgery.

The ENDORSE (Epidemiologic International Day for the Evaluation of Patients at Risk for Venous Thromboembolism in the Acute Hospital Care Setting) study is a multinational cross-sectional survey designed to assess the prevalence of VTE risk in the acute hospital care setting, and to determine the proportion of at-risk patients who receive effective prophylaxis. More than 68000 patients were included from 32 countries from both medical and surgical wards, but only 39.5% of medical patients received VTE prophylaxis appropriately and 58.5% of surgical-based patients (Cohen et al., 2008).

American College of Chest Physicians (ACCP) recommended an individualized approach in making recommendations regarding DVT prophylaxis in hospitalized medical patients based on balancing the benefit of reducing VTE with the risk of bleeding using risk assessment models (Dobesh

PP et al., 2018). ACCP 2012 guidelines used Padua Prediction Scoring System, however, the American Society of Haematology (ASH) 2018 guidelines referred to Padua and IMPROVE as RAMs that may also be useful in predicting VTE and bleeding risk. In the Malaysian Ministry of Health CPG, we are recommended to use the Padua and IMPROVE score for medical patients and CAPRINI score in surgical patients for VTE prophylaxis assessment. The National Health Service (NHS) in England and the Center for Medicare and Medicaid Services in the US have mandated the use of standardized VTE Risk Assessment Models (RAMs) to guide the use of thromboprophylaxis for inpatients. A recent policy statement from the American Heart Association discusses the benefits of these interventions and provides recommendations for improving VTE prevention in hospitalized patients (Cushman et al., 2020).

1.3 Knowledge, Attitude and Practice (KAP) of VTE prophylaxis

A recent study by Mohammed et al., (2020) in Malaysia demonstrated that nonadherence to key performance indicators (KPI) was associated with mortality among ischemic stroke patients. The adherence to guidelines in acute ischemic stroke management was sub-optimal, particularly in DVT prophylaxis with only 18% prescribed. These findings suggest the importance of continuous quality improvement in Malaysia and a reflection of the need for full implementation of guidelines, raising awareness and professional education among health professionals, especially in VTE prophylaxis. The need for KPI for VTE prophylaxis is imminent for hospitalized patients. In the United Kingdom, the VTE risk assessment was formally a national commissioning for

Quality and Innovation (CQUIN) indicator and is a National Quality Requirement in the NHS Standard Contract 2020/21. It sets a threshold rate for acute providers to undertake risk assessments for at least 95% of inpatients each month (England, 2015). However, in Malaysia there is no such KPI available currently.

Tang X et al., (2015) carried out a self-administered questionnaire of 1,861 intensive care unit (ICU) staff in 23 tertiary hospitals in China and found that only 36.5% of physicians and 22% of nurses knew about the national VTE guidelines. Another study in China by Zhou et al., (2019) assessed the awareness of VTE prophylaxis among doctors and medical nursing staffs in the emergency department using questionnaires. The survey has shown deficiencies among A&E medical staff in knowledge and awareness of the management of VTE and participants scoring higher are those with work experience of more than 5 years in the medical field.

In Africa, Ekwere et al., (2015) out a self-administered questionnaire on 52 physicians and 33 surgeons in a tertiary hospital in Nigeria and found that only 18.8% of doctors followed VTE guidelines. Among the remaining 81.2% that did not follow guidelines, 30.8% of them stated lack of knowledge as the key reason. Therefore, it is important to raise the awareness of VTE risk and to implement effective prevention programs in hospitals. In a teaching tertiary hospital in Nigeria, Makusidi et al., (2016) demonstrated that 82% had good knowledge of VTE mechanism and 76.4% knowledge of VTE risk factors, however only 55.9% of respondents ever prescribed any VTE prophylaxis.

Recently, another study was published in Obstetrics and Gynaecology Department in Iraq, by Suker et al., (2021) studying 57 obstetricians and gynaecologists in all hospitals of Al-Najaf province demonstrating poor knowledge and practice (38.6%) toward VTE prophylaxis and poor adherence (63.2%) to prophylaxis guidelines. Hajj et al., (2021) from Lebanon observed 704 patients in medical and surgical wards with 87.6% of them had one or more risk factors for VTE, but only 58.9 % received thromboprophylaxis. In a multinational survey, the AVAIL ME trial with subset in Middle Eastern countries showed low VTE prophylaxis application and adherence to guidelines (Taher et al.,2011). In an intensive care unit at Zagazig University Hospital, Egypt, Mohammed et al., (2018) assessed the ICU nurses. No nurses showed satisfactory VTE prophylaxis practice and only 26% had satisfactory knowledge of the topic even though 56% had a satisfactory attitude toward thromboprophylaxis. This shows why it is also important to assess the nurses as well as the doctors on the importance of VTE and its complications as well as the need for prophylaxis.

1.4 Study Rationale

It is believed that the findings of this study can help our health care system to continuously improve its service. We could also assess the latest knowledge, attitude and the practice perceived or implemented among the doctors and nurses as well. Furthermore, previous studies of interest did not include both doctors and nurses in multiple departments in Malaysia.

The information derived from this study can be used to generate solutions to deficiencies found, and this may even result in a change or

implementation of new hospital policy or even national KPI on VTE prophylaxis assessment and prescription which is not available currently.

1.5 Study Objectives

1.5.1 General Objectives

To determine the knowledge, attitude and practice among health care providers and their associated factors regarding the prescription of VTE prophylaxis.

1.5.2 Specific Objectives

1) To determine the proportion of good knowledge of VTE prophylaxis among the doctors and nurses in various departments in Hospital USM.

2) To determine the proportion of good attitude and practice of VTE prophylaxis among doctors and nurses in Hospital USM.

3) To identify the associated factors on knowledge, attitude and practice of VTE prophylaxis among the doctors and nurses in Hospital USM.

CHAPTER 2

STUDY PROTOCOL

2.1 Introduction

2.1.1 Burden of venous thromboembolism

Venous thromboembolism (VTE) is a major health problem. The term refers to occlusion within the venous system by a blood clot, which may or may not become dislodged from its site of origin and encompasses both deep vein thrombosis (DVT) and its most dangerous complication, pulmonary embolism (PE) (American Society of Haematology, 2019).

It is the third most common cardiovascular disease after myocardial perfusion and stroke in the world. The overall VTE rates are 100 per 100,000 populations per year, of which 70% are hospital acquired (Malaysia MOH, (2013). Between 1 and 3% of patients admitted to hospital will suffer a complication of VTE during hospitalization, and many have increased risk after hospital discharge. Total burden of VTE from hospitalized medical patients is substantial estimating 25–30% of all VTE in the United States is related to medical hospitalization (Nicholson et al., 2020). It has long been perceived that VTE is rare in Asia. However, several recent epidemiological studies seem to refute this. (Liew NC et al., 2017). Nine studies of Asian hospital registries or databases reported VTE rates ranging from 11 to 88 cases per 10,000 admissions (Lee et al., 2017). The importance of preventative measures to

minimize the risk of VTE following hospitalization has been recognized for decades; however, even with the use of prophylaxis the rate of VTE is still high in the community. This is because VTE prophylaxis is underutilized, particularly among high-risk medical patients despite previous mandates from international antithrombotic guidelines such as those of the American College of Chest Physicians (ACCP) for the "universal" use of thromboprophylaxis in hospitalized medical patients (Barbar S *et al.,* 2010). Global audits suggest that implementation of thromboprophylaxis continues to be challenging because of the perceived higher risk of bleeding and lower risk of VTE than that reported in clinical trials. Both pharmacological and mechanical prophylactic interventions have been demonstrated to be highly effective in preventing many VTE.

VTE is a common cause of preventable harm among hospitalized patients, but the knowledge and awareness among the doctors may be lacking. Is it reasonable to provide medical thromboprophylaxis to the hospitalized medical patients, or would this result in over-treatment, inducing more harm than benefit? The answer to this question is not easy and ultimately depends on our awareness about the risk of VTE and the beneficial and adverse effects of medical thromboprophylaxis (Skeik and Westergard, 2020) (Arpaia GG *et al.*, 2020).

Clinical decision-making aided by guidelines is the most effective strategy to reduce the burden of VTE (Abboud *et al*., 2020). Utilization of VTE prophylaxis among hospitalized patients can be significantly improved by implementation of a multifaceted educational program for the medical staffs (Taha *et al*., 2020). There are many published studies on the impact of

initiatives to improve VTE prophylaxis compliance that include various types of feedback, pro-forma, order sets, focused teaching and information provision. Interventions are generally reported to have positive impacts on performance, but generally more inclusive, active initiatives appear to have greater impact than the more passive provision of information and attendance on teaching sessions (Gerotziafas GT *et al.*, 2018). In this study, participants will receive feedback on the knowledge part.

This will be a prospective study where a validated questionnaire will be distributed to the doctors and nurses in various wards to assess the knowledge, attitude and practice of health care providers towards VTE and its prophylaxis prescription. Nurses are included as well in this trial because many institutions believe that nurses education and awareness is equally important however many are lacking in terms of knowledge or awareness regarding VTE prophylaxis. A study by Lau BD et al., (2017) from John Hopkins Hospital reviewed the effectiveness of nurse education to reduce non-administration of prescribed doses of pharmacologic VTE prophylaxis in hospitalized medical and surgical patients and found that education for nurses significantly improves clinical practice. These findings indicate that interactive, learner-centric education might be most appropriate to change practice and should be further applied to other domains of clinical education.

2.1.2 Problem statement & Study rationale

The importance of preventative measures to minimize the risk of VTE following hospitalization has been recognized for decades; however, VTE prophylaxis is underutilized, particularly among high-risk medical patients

because of reduced awareness by the healthcare providers (Nicholson et al., 2020)

It is believed that the findings of this study can help our health care system to continuously improve on its service. We could also assess the latest knowledge and attitude among the doctors and nurse as well as the practice implemented by the doctors. Furthermore, previous studies of interest did not include both doctors and nurses in multiple departments.

The information derived from this study can be used to generate solutions to deficiencies found, and this may even result in change of hospital policy on VTE prophylaxis prescription.

2.1.3 Research Questions

1) What are the proportion of good knowledge and attitude of VTE prophylaxis among doctors and nurses in Hospital USM?

2) What are the proportion of good practice of VTE prophylaxis among doctors and nurses in Hospital USM?

3) What are the associated factors on good knowledge, attitude and practice of VTE prophylaxis among doctors and nurses in Hospital USM?

2.1.4 Research Hypotheses

There are significant associations between socio-demographic characteristics (profession, work experience) with knowledge, attitude and practice of VTE prophylaxis among doctors and nurses in Hospital USM.

2.15 Research Objectives

2.1.5(a) General Objective:

To determine the knowledge, attitude and practice among health care providers and their associated factors regarding the prescription of VTE prophylaxis.

2.1.5(b) Specific Objectives:

1) To determine the proportion of good knowledge of VTE prophylaxis among the doctors and nurses in various departments in Hospital USM.

2) To determine the proportion of good attitude and practice of VTE prophylaxis among doctors and nurses in Hospital USM.

3) To identify associated factors on good knowledge, attitude and practice of VTE prophylaxis among the doctors and nurses in Hospital USM.

2.2 Literature Review

2.2.1 Definition

Venous thromboembolism (VTE) refers to occlusion within the venous system by a blood clot, which may or may not become dislodged from its site of origin and encompasses both deep vein thrombosis (DVT) and its most dangerous complication, pulmonary embolism (PE) (American Society of Haematology, 2019).

2.2.2 Epidemiology

Venous thromboembolism (VTE), comprised of deep vein thrombosis (DVT) and/or pulmonary embolism (PE), is estimated to account for 5–10% of all deaths among hospitalized patients (Cohen AT & Endorse Investigators., 2008). Although VTE is often associated with recent trauma or surgery, physicians should be aware that risks of developing VTE in ill medical patients is up to 20% in hospitalized patients (Spyropoulos AC, 2017)(Spyropoulos AC et al., 2011). Nearly half of all VTEs occur during or even after hospitalization, with pulmonary embolism accounting for 10% of inpatient mortality (Cohen AT & Endorse Investigators., 2008). In addition, non-fatal VTE events are associated with significant morbidities (Tapson et al., 2007).

2.2.3 Risk Factors

Risk factors for VTE can be subdivided into factors that promote venous stasis, factors that promote blood hypercoagulability, and factors causing endothelial injury or inflammation (Dudley EP et al., 2017). These three broad categories, frequently taught as “Virchow’s triad”, have formed the basis for understanding and categorizing the risk factors of VTE for over a century. A clear understanding of the risk factors for VTE is vital to identify patients at risk of VTE who would benefit from thromboprophylaxis (Salahuddin, 2017). Risk factors for the development of VTE in medical patients include (among others) increased age, intensive care admission, hormone replacement therapy, cancer, and other comorbidities including cardiovascular, renal, and respiratory diseases.

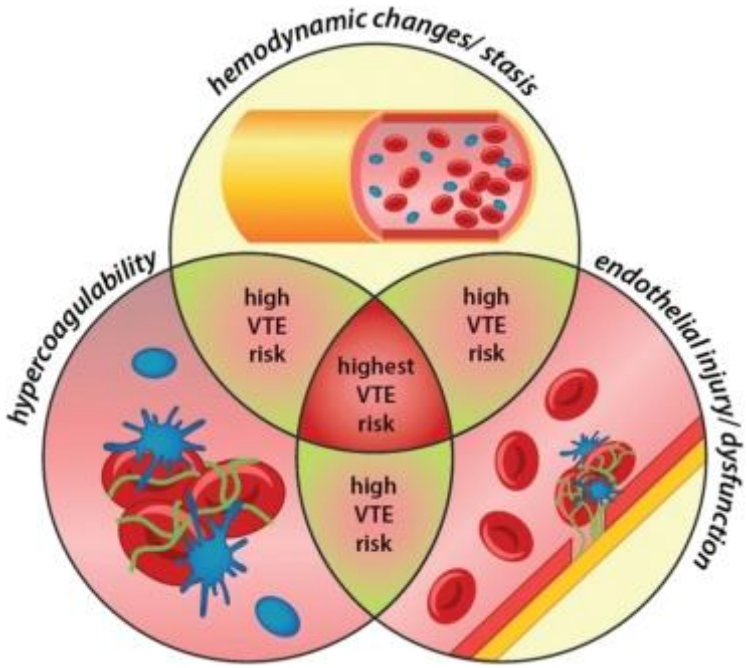

Figure 2.1 Virchow’s Triad (Adapted from Kovačič, 2019)

2.2.4 Risk Assessment Model (RAM) for VTE

Multiple risk assessment models have been developed and validated to help estimate VTE and bleeding risks for hospitalized medical patients (Zhou H Li et al., 2018) (Gerotziafas GT et al., 2018). In November 2011, the American College of Physicians (ACP) published new guidelines for medical patients on VTE prophylaxis (Tay KH et al., 2011). These evidence-based guidelines were not based on new trial data, but rather a review of previous studies looking at only medical patients (Decouses H et al., 2007). The new guidelines recommend that all hospitalized medical patients, including stroke patients, be evaluated for risk of VTE and bleeding, which is not a change from any previous standard. Routine use of VTE prophylaxis is not recommended, and prophylactic pharmacologic therapy with heparin or related drugs should only be instituted if the benefit in a decreased incidence of VTE outweighs the risk of bleeding in an individual patient (Kahn et al.,2007).

In making recommendations regarding DVT prophylaxis in hospitalized medical patients, the American College of Chest Physicians (ACCP) recommended individualized approach based on balancing the benefit of reducing VTE with the risk of bleeding using risk assessment models (Dobesh,P et al., 2018). ACCP 2012 guidelines used Padua Prediction Scoring System, however, the American Society of Haematology (ASH) 2018 guidelines referred to Padua and IMPROVE as RAMs that may also be useful in predicting VTE and bleeding risk. In Malaysian Ministry of Health CPG, we are recommended to use the Padua and IMPROVE score for medical patients to assess for VTE prophylaxis prescription.

Some of the selected Risk Assessment Module (RAM) used for VTE assessment is shown in the Figure 2.2 that is adapted from (Nicholson et al., 2020). The NHS in England and the Centre for Medicare and Medicaid Services in the US have mandated the use of standardized VTE Risk Assessment Models (RAMs) to guide the use of thromboprophylaxis for inpatients. A recent policy statement from the American Heart Association discusses the benefits of these interventions and provides recommendations for improving VTE prevention in hospitalized patients (Cushman et al., 2020)

Tang X et al., (2015) carried out a self-administered questionnaire of 1,861 intensive care unit (ICU) staff in 23 tertiary hospitals in China and found that only 36.5% of physicians and 22% of nurses knew about the national VTE guidelines. Another recent study Zhou et al., (2019) in China assessed the awareness of VTE prophylaxis among doctors and medical nursing staffs in emergency department using questionnaires. In this survey, 180 questionnaires were distributed and 174 valid responses (response rate of 96.67%) were collected and analyzed. The survey has shown deficiencies among A&E medical staff in knowledge and awareness of the management of VTE. Therefore, it is important to raise the awareness of VTE risk and to implement effective prevention program in hospitals.

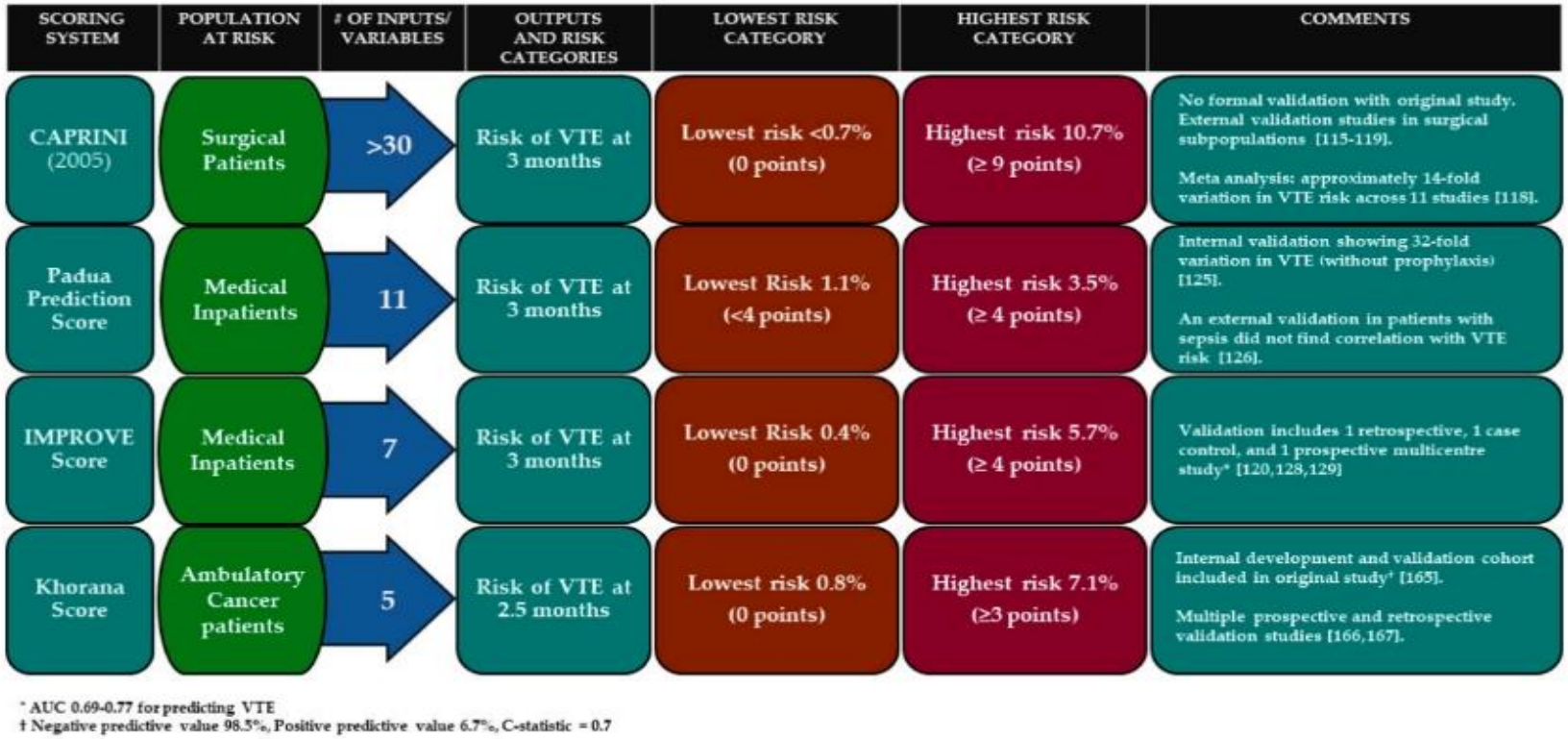

Figure 2.2 Prevention of Venous Thromboembolism in 2020 and Beyond, Selected RAM for VTE prophylaxis. Adapted from (Nicholson et al., 2020)

A recent study by Mohammed,M et al., (2020) in Malaysia demonstrated that nonadherence to key performance indicators (KPI) was associated with mortality among ischemic stroke patients. The adherence to guidelines in acute ischemic stroke management was sub-optimal, particularly in DVT prophylaxis with only 18%. These findings suggest the importance of continuous quality improvement in Malaysia and a reflection for the need for full implementation of guidelines, raising awareness and professional education among health professionals especially in VTE prophylaxis. The need for KPI for VTE prophylaxis is imminent for hospitalized medical patients. The VTE risk assessment in the United States was formally a national commissioning for Quality and Innovation (CQUIN) indicator and is a National Quality Requirement in the NHS Standard Contract 2020/21. It sets a threshold rate for acute providers to undertake risk assessments for at least 95% of inpatients each month in the United States of America.

Table 2.1 Summary from some articles related to KAP of VTE prophylaxis

	Author, Year	Study Location	Target population	n	Knowledge (K), Attitude (A), Practice (P)
1	**(Zhou et al., 2019)**	Emergency Department, CHINA	Doctors and nurses	174 (54 doctors 120 nurses)	only 21% scored 60 points and above for knowledge
2	**(Makusidi et al., 2016)**	Department of Medicine, NIGERIA	Medical practitioners (Junior Doctor- consultant)	200 (80.5% response rate)	**K:** 76.4% **A**: 55.3% **P:** 8.7%
3	**(Ekwere et al., 2015)**	Hematology Department, NIGERIA	Medical and surgical specialists	85 (52 Medicine 33 Surgery)	95.3 % aware but only 16% follow guidelines
4	**(Williams, 2016)**	Surgical Department, Bangor, UK	Junior doctors	394 *patients*	**P:** Only 25% was prescribed with VTE prophylaxis

5	**(Vardi et al., 2012)**	Multinational from member countries of European Federation of Internal Medicine	Internal Medicine physician	226 physicians from 30 countries	20.9% unaware of formal guidelines. 64% worked in departments without a formal VTE prophylaxis program.
6	**(Taher et al., 2010)** **AVAIL ME trial**	Multinational	Medical & Surgical Patients	845 Medical 1245 Surgical	Only 24.5 % of high-risk patient given VTE prophylaxis as per ACCP guidelines
7	**Visberg et al., 2017**	Internal Medicine Wards, Bnai Zion MC, ISRAEL	Patients in medical wards	205 patients	Only 30% of the patients with indications for prophylaxis were treated. The awareness implementation was slow and incremental and increased from 35% to 86%.
8	**(Silva JS et al., 2020)**	Adult units at a teaching hospital in the city of São Paulo,	Nurses	81 nurses	53.3% perceived their own knowledge as Good (self-assessment).

		PORTUGAL			Only an average of 33.1% of nurses answered objective questions correctly
9	**(A.S. Mohammed et al., 2018)**	Medical Intensive Care Units at Zagazig University Hospitals.	ICU nurses	91 nurses	K: 27.5% had satisfactory total knowledge A: 56.0% had satisfactory attitude P: None was satisfactory
10	**(Bhatti et al., 2012)**	Five teaching hospitals in Ravalpindi, PAKISTAN	Healthcare providers (doctors)	196 doctors	Although 98.8% agreed that DVT prophylaxis is clinically important, but only 39.4% prescribed it themselves
11	**(Kahn et al., 2007) CURVE trial**	CANADA	Patients	1363 patients	24 % not on VTE prophylaxis

2.2.5 Conceptual framework

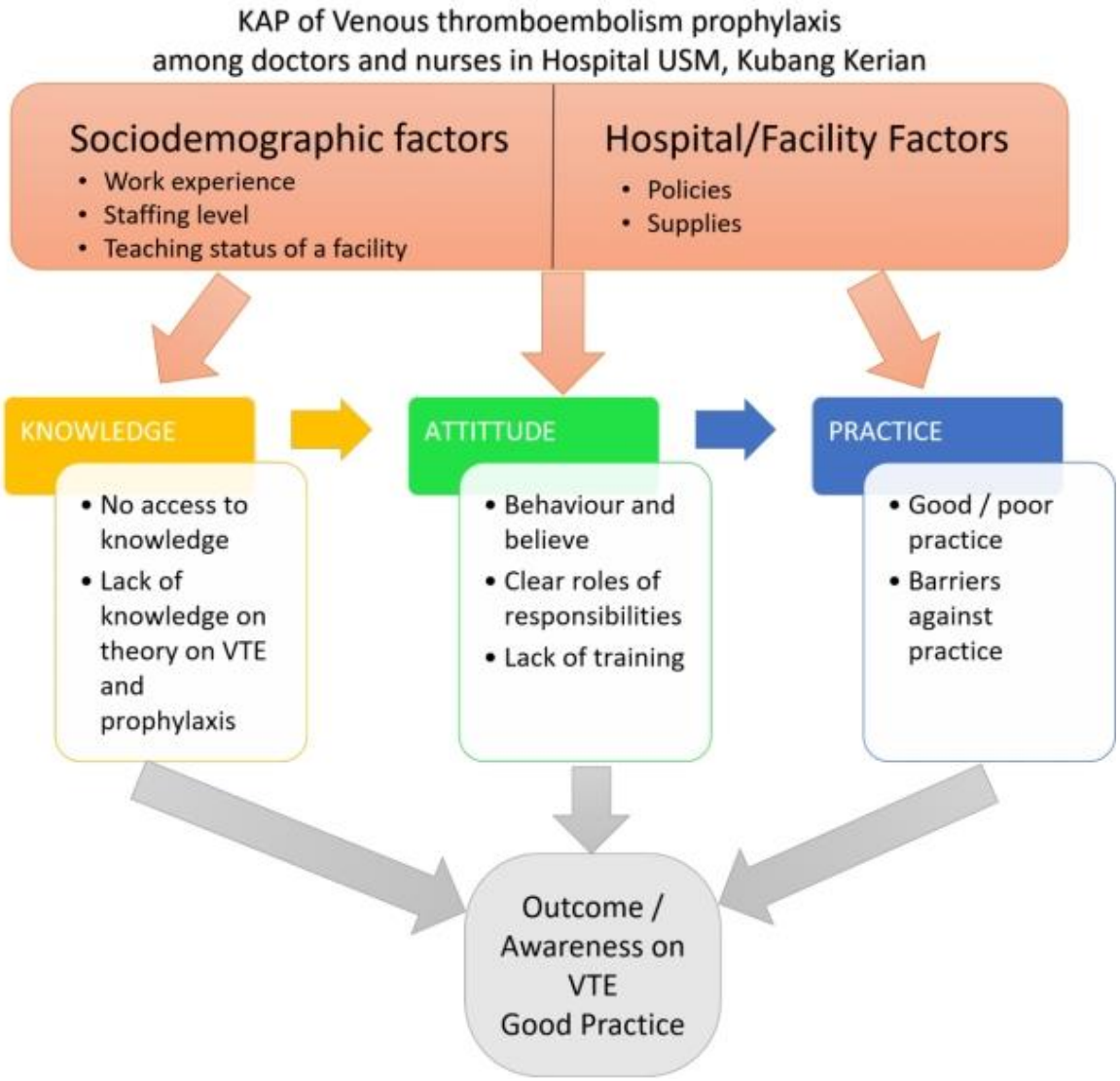

Figure 2.3 Conceptual Framework on knowledge, attitude and practice and the associated factors of VTE prophylaxis in Hospital USM.

2.3 Methods

2.3.1 Research design

This is a cross sectional study

2.3.2 Study duration

1st May 2022 – 31st August 2022

2.3.3 Study area

Hospital USM, Kubang Kerian, Kelantan

2.3.4 Study population and sample

2.3.4(a) Reference population

All doctors and nurses in Hospital USM Kubang Kerian, Kelantan.

2.3.4(b) Source population

All doctors and nurses in Hospital USM, Kubang Kerian, Kelantan from 1st May 2022 to 31st August 2022.

2.3.4(c) Sampling frame

All doctors and nurses in Hospital USM, Kubang Kerian, Kelantan from 1st May 2022 to 31st August 2022 that fulfil inclusion criteria.

Inclusion criteria:

1. Doctors with full Malaysian Medical Council (MMC) registration
2. Nurses with full Malaysian Nursing Board (Lembaga Jururawat Malaysia, LJM) registration.

Exclusion criteria:

1. Doctors in non-clinical roles (e.g: Hospital administrators, PhD statisticians in medical settings)
2. Nurses in non clinical roles (e.g: Nurse Administrators)

2.3.4(d) Sample size estimation

Sample size was calculated and the largest number obtained was taken as the required sample size for this study.

Objective 1

Objective: To determine the proportion of good knowledge of VTE prophylaxis among the doctors and nurses.

Method: We applied the Single Proportion Formula using Sample Size Calculator by Arifin, W. N. (2021) to estimate our sample size of the first objective. Detail of the formula is listed below:

Proportion of knowledge of VTE prophylaxis among the doctors and nurses (Makusidi et al, 2018) (P) = 0.76

Z value based on 95% CI = 1.96

Precision (Δ) = 0.05

Number of sample size (n) = 278

Drop-out rate = 30 %

Total sample size = 398