SCHOOL OF PUBLIC HEALTH

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ASSESSMENT OF THE KNOWLEDGE, PRACTICES AND PREVENTION OF VENOUS THROMBOEMBOLISM IN KORLE BU TEACHING HOSPITAL

BY

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DECLARATION

I, Christian Owoo, declare that this dissertation is entirely my own work. Reference to, quotation from, and discussion of the work of any other person has been duly acknowledged within the work in accordance with University guidelines. I further declare that this dissertation either in whole or in part has not been submitted for any degree programme in this university or other universities elsewhere.

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DEDICATION

I humbly dedicate this work to my lovely and pretty wife Mrs. Precious Owoo for her love, encouragement and support during this very challenging past year.

And to my family and friends for being there for Lady P and I. May God bless you all for your prayers and generosity.

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ABSTRACT

Background: Considering the high prevalence of venous thromboembolism (VTE), its complications and mortality, it has become essential to assess the level of knowledge and preventive practices of health workers in Ghana as well as to establish the true profile and prevalence of VTE risk among adult hospitalized patients.

General Objective: To assess the VTE knowledge and prevention practices of health workers; and the VTE risk profile (prevalence) among adult hospitalized patients in Korle Bu Teaching Hospital, Accra.

Methods: The study employed a quantitative cross-sectional design in studying adult hospitalized patients and health workers in KBTH. Data was collected from 233 health workers and 267 patients in five clinical departments by systematic random sampling, using structured questionnaires and a modified Caprini VTE risk assessment tool. Data was analyzed using descriptive statistics (frequencies, percentages, proportions, means ± SD, median and IQR). Chi square/ Fishers' exact test was used to determine association between two categorical variables e.g. VTE knowledge and profession. Mann-Whitney and Kruskal-Wallis tests were used to compare medians between two or more groups appropriately e.g. VTE risk levels and thromboprophylaxis modalities.

Results: The overall mean VTE knowledge score among health workers in KBTH was 51.8%. The average score of doctors was, however, much higher than nurses (68.0% vs. 40.1%, $p<0.001$). Almost all, 229 (98.7%) of the health workers perceived VTE thrombo-prophylaxis as being clinically important with 85 (82.5%) of prescribers, self-reporting routine or frequent prescription of thrombo-prophylaxis. Low molecular weight heparin (LMWH) (94.2%) was the most prescribed method of thrombo-prophylaxis. The prevalence of high risk of VTE among adult hospitalized patients in KBTH was 47.2%; with significantly higher prevalence in the Intensive

Care Unit (ICU) and Accident, Trauma and Orthopaedic patients (76.7% and 61.5%, p<0.001). Thrombo-prophylaxis rate in the hospital was generally low, with LMWH (30.0%) and anti-embolic stockings (28.5%) as the commonest methods used but there was significant departmental association.

Conclusion: The VTE knowledge level of health workers in KBTH is generally less than ideal with doctors significantly more knowledgeable than nurses. The self-reported perception and thromboprophylaxis practices of health workers were acceptably good but do not reflect the actual thrombo-prophylaxis received by patients. There was no statistically significant association found between the VTE knowledge level of health workers and their self-reported thrombo-prophylactic practices

The prevalence of high risk of VTE among hospitalized adult patients in KBTH is high (47.2%) and is greatest at the ICU and Accident, Trauma and Orthopaedic patients.

Key words: venous thromboembolism, risk assessment, thrombo-prophylaxis, knowledge, practices, health workers, hospitalized patients.

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LIST OF ABBREVIATIONS

ACCP	American College of Chest Physicians
A-Level	Advanced Level
CAD	Coronary Artery Diseases
CD	Crohn's Disease
CI	Confidence Interval
CVDs	Cardiovascular Diseases
DK	Don't Know
DVT	Deep Vein Thrombosis
ENDORSE	Epidemiological International Day for the Evaluation of Patients at Risk for Venous Thromboembolism in the Acute Care Setting
GCS	Graduated Compression Stockings
GHS	Ghana Health Services
HAC	Health Assistant Clinical
HPPM	Health Policy, Planning and Management
IBD	Inflammatory Bowel Disease
ICU	Intensive Care Unit
IPC	Intermittent Pneumatic Compression
IRB	Institutional Review Board
IVC	Inferior Vena Cava
LDUH	Low Dose Unfractionated Heparin
LMWH	Low molecular weight heparin
LQ	Lower Quartile
MIDO	Midwifery Officer
MO	Medical Officer
MPH	Masters in Public Health
NCTC	National Cardiothoracic Centre
NHMRC	National Health and Medical Research Council
NICE	National Institute for Clinical Excellence
NICS	National Institute of Clinical Studies
NO	Nursing Officer
O-Level	Ordinary Level
OR	Odds Ratio
Ortho	Orthopaedics
PE	Pulmonary Embolism
PMIDO	Principal Midwifery Officer
PNO	Principal Nursing Officer
SCDs	Serial Compression Devices
SD	Standard Deviation
SHAC	Senior Health Assistant Clinical

SHS	Senior High School
SMID	Staff Midwife
SMIDO	Senior Midwifery Officer
SMO	Senior Medical Officer
SN	Staff Nurse
SNO	Senior Nursing Officer
SOBS	Social and Behavioral Sciences
SPH	School of Public Health
SSA	Sub Saharan Africa
SSMID	Senior Staff Midwife
SSN	Senior Staff Nurse
STC	Scientific and Technical Committee
UC	Ulcerative Colitis
UFH	Unfractionated Heparin
UK	United Kingdom
UQ	Upper Quartile
VTDs	Venous Thromboembolic Diseases
VTE	Venous thromboembolism
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Venous thromboembolism (VTE) is a disease that includes deep vein thrombosis (DVT) – blood clot formed in a deep vein; and pulmonary embolism (PE)–blood clot broken up or dislodge and transported to block blood vessels in the lungs(Khan et al, 2017; Heit, 2015). The pathogenic triad of stasis, hypercoagulable state of the blood and endothelial damage has long been known to be major factors that favour the formation of thrombi. These factors, therefore, explain the role of VTE in complicating the course of ill health in hospitalized, recuperating, peri-operative, immobilized or pregnant patients (Heit, 2015).

VTE is quite common but the detection of its risk and prevention may be difficult. Most cases require a high index of suspicion and the aid of validated or simplified risk assessment tools to determine patients who are at risk and their level of risk (Collins et al. 2010; NHMRC, 2009). This enables the institution of thrombo-prophylactic measures which have been found to significantly reduce the development of hospital acquired venous thromboembolism and its associated morbidity and mortality (NHMRC, 2009).

It is important to note that the common presenting features of VTE of painful, tender, swollen limb which is warmer than the other limb are non-specific and may be easily mimicked by other conditions such as cellulitis and lymphangitis (Elliot, 2000).

VTE remains a fatal complication and a frequent cause of death among hospitalized patients admitted for remediable and often minor conditions which in themselves were not deemed life-threatening (Heit, 2015, Heit 2005).

A study conducted in Nigeria revealed autopsy-diagnosed VTE with a prevalence of 2.9% among 989 autopsies documented within an 8-year period (Korubo, Omunakwe, & Ekeke, 2015). In another study which set out to determine the proportion of at-risk hospitalized patients who received effective types of VTE prophylaxis in Sub-Saharan Africa, it revealed that the prevalence of VTE risk among hospitalized patients was 57.0% overall, 57.4% in medical and 60.3% in surgical patients (Ba et al, 2011).

Aduful and Darko (2007) surmised in a study conducted in young ambulant Ghanaians with deep vein thrombosis that DVT in young ambulant people may not be uncommon in Ghana and has to be thought of in all patients who present with a unilateral painful or non-painful swollen lower limb. A sedentary life style or work pattern seems to be the foremost predisposing factor. They recommended the set up of a national database to document the true incidence of this potentially deadly disease (Aduful& Darko, 2007).

1.2 Statement of the Problem

Hospital acquired venous thromboembolism and its complications including high mortality is not uncommon (Heit 2015, Khan 2017). There are VTE risk assessment tools that are validated for the assessment and prediction of the level of risk for both surgical and non-surgical patients and to direct the institution of appropriate preventive measures against the development of deep vein thrombosis and venous thromboembolism (Collins et al. 2010; NHMRC, 2009).

The prediction or detection of the level of VTE risk, the use of these risk assessment tools and ultimately prevention of hospital acquired VTE requires an adequate level of knowledge of health workers on venous thromboembolism, predisposing risk factors and

options available for VTE prevention (Tang et al, 2015). It also requires an adequate knowledge and appropriate use of risk assessment protocols as well as evidence-based thrombo-prophylactic practices.

There is paucity of literature in Ghana and Sub-Saharan Africa on the profile or prevalence of risk of VTE in hospitalized patients or the actual incidence of venous thromboembolism. This creates the impression sometimes, that the condition is uncommon in the African. The few reports in literature on DVT in Sub-Saharan Africa have mainly been on the post-operative patient, ambulating fit young adults or based on post-mortem findings. There is also a scarcity of literature on the level of knowledge of health workers regarding VTE and how this relates to their assessment of VTE risk in patients and their thrombo-prophylactic practices.

Considering the high prevalence of risk of VTE documented in other settings, the associated complications and mortality, and the potential barriers to appropriate patient care from poor knowledge and preventive prophylactic practices, it has become essential to assess the level of knowledge and preventive practices of health workers in Ghana as well as to establish the true prevalence of the risk of VTE among our hospitalized patients. This information will be help to devise appropriate guidelines and interventions to reduce the incidence, morbidity and mortality of hospital acquired VTE.

1.3 Conceptual framework of the study

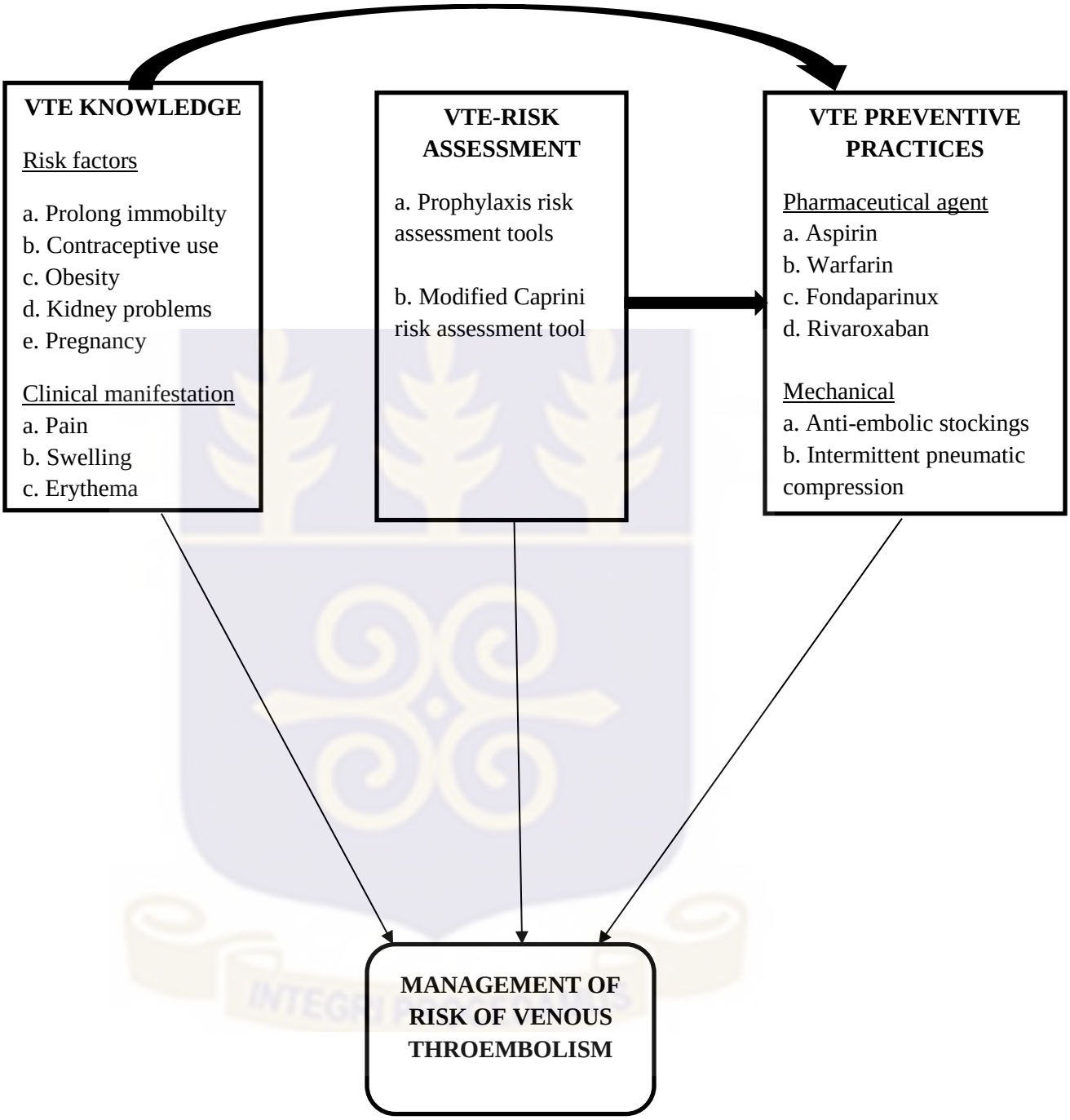

Figure 1.1: Conceptual framework showing the relationship of health worker knowledge and preventive practices and the management of VTE risk

Several studies have suggested that detection of the risk of venous thromboembolism is underpinned by a number of factors (NHMRC 2009, Collins et al 2010). However, early detection of level of risk of venous thromboembolism is perceived from three main viewpoints as far as this study is concerned; health worker knowledge, patient risk assessment and preventive practices.

The prediction or detection of the level of venous thromboembolism risk, the use of risk assessment tools and ultimately prevention of hospital acquired venous thromboembolism requires an adequate level of knowledge of health workers on venous thromboembolism. Health workers informed knowledge on the VTE risk factors including length of hospitalization, patient characteristics, admitting specialty, history of prolong contraceptive use, obesity, kidney problems, pregnancy, pain, swelling and erythema are crucial. Most of patients' risks of VTE are undetected by health workers when on admission for the paucity of informed knowledge on the plausible causes and risk factor of the condition.

Furthermore, once health workers are knowledgeable on venous thromboembolism risk ; the knowledge of the appropriate VTE risk assessment tools to use for prediction of patient's level of VTE risk and regular institution of preventive measures are crucial in the reduction of the incidence of VTE among hospitalized patients. Thus, there are VTE risk assessment tools (group prophylaxis models, Caprini risk assessment model) that are validated for the assessment and prediction of the level of risk for both surgical and non-surgical patients and to direct the institution of appropriate preventive measures against the development of venous thromboembolism.

Knowing the most appropriate management modalities for the different VTE risk levels is key to the administration of the right form of preventive or therapeutic intervention considering the high prevalence of risk of VTE documented in other settings, its associated complications and mortality. In combination, adequate health worker knowledge, timely risk assessment and institution of appropriate preventive practices, are key to reducing the incidence, morbidity and mortality of hospital acquired VTE.

1.4 Justification

Level of knowledge and ability to assess and accurately predict the level of risk of patients to the development of VTE are essential independent variable that may affect preventive practices and the incidence of VTE. The information obtained from this study will, therefore, set the background for the development of the appropriate guidelines for both training and interventions targeted at reducing the incidence of hospital acquired VTE and its associated morbidity and mortality.

1.5 Research Questions

1. What is the venous thromboembolism knowledge and preventive practices of health workers in Korle Bu Teaching Hospital, Accra?
2. What is the prevalence or profile of risk of venous thromboembolism among hospitalized patients in Korle Bu Teaching Hospital, Accra?

1.6 Study Objectives

1.6.1 General Objective

To assess the VTE knowledge and prevention practices of health workers; and the VTE risk profile (prevalence) among adult hospitalized patients in Korle Bu Teaching Hospital, Accra.

1.6.2 Specific Objectives

1. To assess the knowledge of health workers in Korle Bu Teaching Hospital on venous thromboembolism
2. To assess the venous thromboembolism prevention practices of health workers in Korle Bu Teaching Hospital, Accra.
3. To examine the association between level of VTE knowledge of health workers and thrombo-prophylactic practices
4. To characterize the risk profile of venous thromboembolism among adult hospitalized patients in Korle Bu Teaching Hospital, Accra.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews published work on venous thromboembolism. This includes definitions, causes, epidemiological burden, risk factors, clinical presentations and complications of venous thromboembolism. It also discusses the risk assessment models of venous thromboembolism, the prevalence of its risk as well as the knowledge, attitude and practices of health workers on venous thromboembolism.

2.2 Definition and causes of Venous Thromboembolism

Venous thromboembolism (VTE) is a disease that includes deep vein thrombosis (DVT) – blood clot formed in a deep vein; and pulmonary embolism (PE) – blood clot broken up or dislodge and transported to block blood vessels in the lungs (Khan et al, 2017; Heit, 2015). DVT can form anywhere in the venous system(Khan et al, 2017; Heit, 2015; NICE , 2005). However, DVT and PE are the commonest clinical expression of VTE (Heit, 2015). Common sites of occurrence of DVT are in the deep veins in the legs, thighs, or pelvis (Khan et al, 2017; Heit, 2015). A PE occurs when a blood clot in the deep vein breaks up into smaller clots and sent with the blood flow to deposit in the lungs. This is a serious life-threatening complication.

The risks for VTE are multi-factorial. Genetically Inherited thrombophilia which affects 1 in 20 of the population, results in hypercoagulability of blood(NICE report, 2005). There are many other acquired etiological factors to the development of VTE. These risk factors include: previous surgery (especially gynaecological, orthopaedicand neurosurgery),

trauma, pregnancy, obesity, use of oral contraception, hormone replacement therapy and cancer drugs, prolonged immobilization, cancer, heart failure, elevated blood levels of homocysteine, certain disorders of the blood (polycythemia vera or essential thrombocythemia), kidney problems, antiphospholipid antibodies, previous history of DVT (NICE report, 2005).

2.3 Burden of Venous Thromboembolism

In Western countries VTE affects about 1-2 per 1000 people every year and represents the third commonest disease of the cardiovascular system coronary artery disease (CAD) and cerebrovascular accident. About two-third of all the cases of VTE are DVT, while the rest are from PE (Heit, 2015; Kröger et al., 2012).

Africa faces a growing epidemic of non-communicable diseases among which cardiovascular diseases (CVDs) remain the most frequent and a major cause of disease-associated mortality (Mbewu &Mbanya, 2006). In 2012, the WHO estimated that CVDs were responsible for 17.5 million deaths globally, with over three quarters occurring in low and middle-income countries, such as those in Africa (WHO 2002; WHO, 2012). Although the increasing burden of CVDs in recent years has been attributed to an increase in the prevalence of atheromatous diseases, venous thromboembolic diseases (VTDs) still remain a major cause of CVD burden. VTDs are among the three major causes of CVDs worldwide after ischaemic heart disease and stroke and it is associated with significant morbidity and mortality. Usually, DVT and PE occur as postoperative complications, affecting about 33% of patients undergoing an elective general surgical procedure (Snyman & Potgieter, 2004).

There are still a lot of cases that go unrecognized, undiagnosed or undocumented. In the United Kingdom (UK), VTE is a major cause of morbidity and mortality in both hospital and community setting resulting in an estimated 60, 000 deaths annually, more than 40% of these cases are considered to be potentially preventable with implementation of VTE prevention strategies (Caroline, Bmedsci, Frca, Marval, & Bmbs, 2017)

Although, there is paucity of studies conducted in Sub Saharan Africa (SSA) on the health and economic impact of VTE, a study in Nigeria revealed an autopsy-diagnosed VTE with a prevalence of 2.9% among 989 autopsies documented over an 8 year period of the study (Korubo, Omunakwe, & Ekeke, 2015)

Most of the reviews in this section are all done in developed nations with just a handful reported on Africa. As African populations may differ from those of the developed world in terms of genetic background, specific living conditions including limited access to medical care, diagnosis and preventive interventions for VTDs, the burden of VTE might be different in African populations. Hence, it would be informative to know the riskr profile of hospitalized adult patients in our hospitals.

2.4 VTE risk assessment

Most DVTs are clinically silent. A study of major trauma patients found that only 1.5% of patients with DVT had any symptoms suggestive of DVT, such as, pain, swelling, erythema, or palpable cord, despite a proximal DVT rate of over 57% (Geerts et al. 1994). Another study of stroke patients showed death was the presenting manifestation in 50% of patients with PE, verifying that VTE may be clinically silent before culminating in death (Elliot, 2000). These observations suggest that routine screening for DVT and assessment

of risk in asymptomatic patients may be valuable, particularly in high-risk populations, because waiting for symptoms to develop may cause clinicians to miss the majority of DVTs and place patients at risk for potentially life threatening PE (NHMRC 2009, Collins et al 2010).

Clinical guidelines which are evidence-based are introduced to link clinical practice and research, and to assist health workers in standardizing decision making in the prevention and management of VTE (Farquhar, Kofa & Slutsky, 2002). The development of these assessment and management models are done after reviewing of available evidence in conjunction with clinical experts (Farquhar, Kofa & Slutsky, 2002). Adoption of national and hospital-wide VTE policies and guidelines promotes standardization of patient care, appropriate decision making and resulting in an improvement in the delivery of quality health care (Farquhar, Kofa & Slutsky, 2002).

2.5 Risk factors of VTE

Hospital-acquired VTE risk factors include advancing age, increasing body mass index, thrombophilia, cancer, recent trauma or surgery, acute coronary syndrome or cerebrovascular accident, prolonged immobilization, admission to an intensive or coronary care unit (Zakai, Wright, & Cushman, 2004; Chopard, Spirk, & Bounameaux, 2006). The risk of VTE is higher in patients with cancers of the brain, pancreas, stomach, lungs, kidneys, or bones, compared with other locations and in patients with metastases (Chew, 2006). Patients with cancer, on immunosuppression or cytotoxic chemotherapy, are at even higher risk of VTE (Chew, 2006).

Also, high serum triglyceride level after menopause doubles VTE risk (Doggen, 2004). However, there is uncertainty about the risk due to atherosclerosis on the development of VTE (Sorensen, 2007). Diabetes mellitus, acute coronary syndrome, tobacco use and chronic obstructive airway disease do not independently increase the risk of VTE (Folsom & Chamberlain 2008; Chamberlain et al. 2008). Congestive cardiac failure independent of prolonged hospitalization poses a low risk of developing VTE (Samama, 2000).

Furthermore, in women, pregnancy, oral contraception, hormone treatment and drugs such as tamoxifen and raloxifene increases the risk for VTE (Heit, 2005; Adomaityte, Farooq, Qayyum, 2008). Second generation oral contraception has lower VTE risk compared to First-generation and third-generation oral contraceptives. Injectable medroxyprogesterone acetate contraception increases VTE risk threefold, whereas there is no additional risk posed by levonorgestrel intrauterine device (Hylckama et al. 2010).

Pregnancy and postpartum impacts a fourfold and fivefold higher relative risk respectively on women during the reproductive age of a woman (Heit, 2005). Previous history of superficial vein thrombosis in pregnancy independently increases the risk factor for VTE (Roach, 2013).

A study suggests that VTE exhibits a complex mode of inheritance, interacting with clinical risk factors (Zöller et al, 2013). Inherited procoagulant states including protein C and protein S deficiency are well-documented rare but potent risk factors for VTE (Vossen & Rosendaal, 2005).

2.6 Prevalence of risk of VTE and risk assessment tools

Literature in Sub-Saharan Africa on the prevalence and risk factors of VTE are relatively limited with a retrospective postmortem based study conducted in Nigeria over a period of eight year involving almost 1000 postmortems revealing a PE prevalence of 2.9% (Kesieme et al, 2016). The commonest associated risk factors were found to be malignancy (38%) and more than 4 days immobility (28%).

In another study based on the ENDORSE study model conducted in Senegal among hospitalized patients the overall prevalence of VTE risk was found to be 57.0%; with 54.7% in the medical patients as against 60.3% among surgical patients (Ba et al, 2011).

Evidenced-based, risk factor-weighted risk assessment tools are utilized in the identification of potential VTE risk factors and have built-in scoring systems that calculate an overall VTE risk score for a patient. These are based on standardized criteria. The American College of Chest Physicians (ACCP) guidelines suggested that VTE Group Prophylaxis assessment tool is to be most appropriate in the assessment of VTE risk categorizing patients into low, moderate and high risk (Geerts, 2008).The flaws in VTE Group Prophylaxis tools includes under or over estimating the VTE risk, as well as not distinguishing the variables that contribute to the category classification. In contrast to the ACCP Group Prophylaxis model, the Caprini Risk Assessment Model creates an individualized risk assessment score based on presence or absence of over 35 risk factors (Caprini, 2005). The Caprini model's ability to predict VTE risk has been validated for general, urologic, and vascular surgery patients as well as those patients having post-bariatric body contouring surgery (Bahl et al. 2009; Hatef et al. 2008).

The utility of Caprini risk assessment approach is supported by a retrospective study of 8,216 patients between July 2001 and January 2008 at the University of Michigan (Caprini, 2010). Using the Caprini risk factor scoring system, they found that patients who had a score of 0–1 had 0% VTE incidence, while those with a score >8 had approximately 6.5% incidence of VTE at 30 days. The independent factors associated with increased VTE for the whole group included recent pregnancy, malignancy, a history of VTE, as well as central venous access. The study concluded that the Caprini score accurately reflects the anticipated 30-day clinical VTE incidence. This score, if very high, might further identify patients who are likely to benefit from extended out of hospital prophylaxis, and there might be a 'super high risk' category such that prophylactic full-strength anticoagulation may be indicated (Caprini, 2010).

2.7 Knowledge, attitude and practices of VTE

A survey on evaluation of hospital nurses' perceived knowledge and practices of venous thromboembolism assessment and prevention revealed that although about seven in every ten clinical nurses demonstrated a good or fair level of knowledge about VTE risk assessment, they were less confident when it comes to the performance of the risk assessment (Lee et al. 2015).

Another study investigating perceived DVT-related knowledge and compliance among registered nurses reported that 44% perceived their knowledge to be good (Lee et al, 2014). There was positive correlation between VTE knowledge and compliance of VTE risk assessment. Routine inclusion of VTE risk assessment is crucial in the reduction of VTE among hospitalized patients.

In a Pakistani cross sectional study assessing knowledge, attitude and practices of health workers in five teaching hospitals around Rawalpindi, although 98.8% agreed that DVT prophylaxis is clinically important, but 39.4% actually prescribed it themselves (Bhatti, Ahsin, Salim, & Mansoor, 2012). Out of these, only 10.3% respondents did it routinely and Low molecular weight heparin was the preferred prophylaxis (36.7%). The study concluded that knowledge and practices of healthcare providers about DVT prophylaxis in hospitalized patients is less than ideal and there is the need for hospital-wide guidelines for thrombo-prophylaxis.

2.8 Preventive measures for VTE

Treatment of VTE is usually initiated with subcutaneous injections with low molecular weight heparin (LMWH) and proceeds with warfarin when the diagnosis is confirmed. The treatment with LMWH is continued until the PT reaches therapeutic range (Bates & Ginsberg, 2004). The duration of treatment depends on the patients estimated risk of recurrence. Nonetheless, to prevent thrombus extension, decrease the risk of recurrent thrombosis and subsequent death in patient, VTE pharmacological and/or mechanical approaches can be administered.

The effectiveness of subcutaneous low dose unfractionated heparin (LDUH), low molecular weight heparin (LMWH), Fondaparinux, Rivaroxaban and Dabigatran for preventing VTE have been well established. There is a requirement for VTE prophylaxis protocols with medical practitioners selecting the dose, dosage interval and brand of prophylactic agent for each individual patient having referred to full product information. Aspirin may have at best a weak protective effect against DVT but is generally not

recommended for prophylaxis (Geerts et al. 2008). Adjusted dose warfarin may have a role in some high risk surgical patients but requires close monitoring of its effect (Clagett & Reisch 1988; Mismetti et al 2004).

A 2004 study demonstrated the efficacy of therapeutic anticoagulation and heparin prophylaxis during stroke rehabilitation in prevention of VTE, as well as the inferior efficacy of antiplatelet agents in this population (Harvey et al. 2004). A meta-analysis of VTE prophylaxis of surgical patients demonstrated that LMWH was at least as effective as unfractionated heparin (UFH) in reducing the incidence of VTE (Jorgensen et al. 1993). However, a study demonstrated the superiority of low molecular weight heparin (LMWH) over unfractionated heparin for DVT prophylaxis after ischemic stroke, based on its once daily administration schedule, and its increased effectiveness at preventing VTE (Sherman et al. 2007).

Two main types of mechanical devices, Graduated Compression Stockings (GCS) and Intermittent Pneumatic Compression (IPC), are widely used in the prevention of VTE. The National Institute for Health and Clinical Guidelines (2007) in the United Kingdom states that GCS reduce the risk of DVT by 51%. While studies have generally involved thigh length stockings (Sajid et al. 2006), it is accepted that below knee stockings are as effective in reducing the risk of DVT development in most patients. IPC reduces the incidence of DVT and is more effective than GCS in high risk patients in combination with anticoagulants or when anticoagulants are contraindicated (MacLellan & Fletcher 2007).

CHAPTER THREE

METHODS

3.1 Introduction

This chapter looks at the methods employed in the conduction of this study. This includes the description of the study site and settings, the design of the study, the populations of respondents being studied, criteria for qualifying to be recruited or excluded from the study, determination of sample sizes and the procedure for sampling respondents. The collection and management of study data and relevant ethical considerations pertaining to this studied has also been discussed.

3.2 Study Site

Korle Bu Teaching Hospital is a tertiary referral hospital in the southern sector of Ghana. It is the largest hospital in West Africa and is located about 450 meters from the Korle Lagoon in the Ablekuma Sub-Metro of Ghana and covers an area of about 44 acres. The foundation stone of the hospital was laid in 1921 and building was officially commissioned on the 9th October, 1923 by the then Governor of the Gold Coast, Sir Gorden Guggisberg.

The hospital has seen gradual expansion over the years to its current capacity of over 2000 beds. It runs a 24-hour service and has staff strength of about 4500 in various health and administrative disciplines. Currently, the hospital has 17 clinical and diagnostic departments and units, with different categories of personnel. It has an average daily out patients' attendance of 1,200 with an admission rate of about 150 patients per day. It has a bed capacity of 2000 in its 48 functioning wards with 430 doctors and 1050 nurse.

The clinical and diagnostic departments are; Medicine, surgery, Obstetrics and Gynecology, Allied Surgery, Pathology, Hematology, Laboratories, Radiology, Anesthesia, and Polyclinics. Others are Surgical and Medical Emergency, Accident Trauma, Pharmacy, Central Sterilization and Supply Department and Physiotherapy.

The study was concurrently conducted in five (5) clinical departments (Internal Medicine, Surgery, Obstetrics, Accident Trauma & Orthopaedics and Anaesthesia & ICU). These clinical settings were chosen to give a compressive representation of the different adult hospitalized patient populations by specialty in the hospital and this is expected to facilitate comparison of the risk prevalence or profile among these groups as well as the knowledge and practice of health workers in these specialties.

3.3 Study Design

This was a facility-based cross-sectional study using a quantitative method to assess the knowledge, practices and prevention of venous thromboembolism in Korle Bu Teaching Hospital, Accra. A cross-sectional study was used because it involved the analysis of data collected from a population at one specific point in time.

3.4 Study Population

The study population was hospitalized adult patients in the selected departments and units, and clinical health workers (doctors and nurses)in the same study sites

3.5 Inclusion criteria

- Permanent medical and clinical health workers (doctors and nurses) who have been in the hospital for at least one year or more
- Patients on admission aged 18 years and above who were able to provide informed consent
- Patients on hospital admission for at least one day during the period of the study
- Patients admitted on referral from other hospitals and/or clinics and on admission for at least one day

3.6 Exclusion Criteria

- Non-medical and non-nursing staff (orderliness, administrators, technicians, clinical psychologist)
- Medical and nursing health workers on rotation and/or housemanship
- Newly admitted Patients (less than one day on admission)

3.7 Sample size determination

The sample size for the study was calculated using the formulae Cochran's formula;

$$n_0 = \frac{Z^2 \times P \times (1 - P)}{e^2}$$

Where:

n= desired sample size,

Z= Z-score at 95% confidence level for two tail test =1.96,

P= Prevalence of outcome variable

e=margin of error = 5%.

Adult hospitalized patients

P= prevalence of the risk venous thromboembolism 0.50 (Barker &Marval2010).

$$n_0 = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.05^2} = 384.16 \approx 384$$

Adjusting for finite population correction factor

With N= Expected total number of patients on admissions in the selected departments as at the time of the study = 850

$n_0 = estimated\ unadjusted\ sample\ size$=384

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} = \frac{384}{1 + \frac{384 - 1}{850}} = 264.7 \approx 265$$

Hence, minimum required sample size for adult hospitalized patients = 265

Health workers

P= Proportion of health workers with good VTE knowledge = 44% (Lee et al, 2014)

$$n_0 = \frac{1.96^2 \times 0.44 \times (1 - 0.44)}{0.05^2} = 378.6 \approx 379$$

Adjusting for finite population correction factor

With N= Expected total number of qualified health workers in the selected departments as at the time of the study = 600

$n_0 = estimated\ unadjusted\ sample\ size$=379

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} = \frac{379}{1 + \frac{379-1}{600}} = 232.5 \approx 233$$

Hence, minimum required sample size for qualified health workers = 233

At the end of the study period 233 health workers and 267 hospitalized patients were successfully recruited and fully participated in the study.

3.8 Study variables

Table 3.1: Dependent and independent variables definition

Independent variables	**Operational definition**	**Scale of measurement**
Age	Age at last birthday	Continuous
Sex	Male or female	Nominal
Education level of patients	None, primary, secondary vocational/technical, tertiary	Ordinal
Duration in hospital	Number of days of Hospitalization of patients	Continuous
Diagnosis on admission	Working diagnosis	Ordinal
Health worker's rank	Professional rank of health worker	Ordinal
Health worker's length of practice	Years of licensed practice	Ordinal
Department/ specialty of health worker	Specialty of training or work of health worker	Ordinal
Dependent variables		
VTE Risk Prevalence or Profile	Level of patient's risk to VTE	Categorical
Clinician knowledge of VTE	Level of knowledge of VTE	Categorical
Attitude towards VTE	Perception of VTE	Ordinal
Preventive practices	Measures to prevent VTE	Ordinal

3.9 Sampling Procedure

In all, adult patients on admission were selected from each of the 5 clinical departments including the intensive care units (Anaesthesia and Medical) into the study based on the criteria for inclusion already described. A minimum of about 40 patients were recruited from each study setting.

Folders and/or records in the hospital's database of adult patients on admission from March 2018 to May 2018 were selected from the various departments. The study data was collected over a 6-week period.

Systematic sampling method was used for participant selection. Available hospital and departmental data on bed capacity and average bed occupancy were used to estimate expected patient population on admission (for each study area) over the study period and this was divided by the allocated sample size for each department to determine the skip or sampling interval (k) for each study area. A simple random sampling method was used to select the first participants for each study area (department) and the skip interval applied for selection of subsequent participants to be included in the study.

Same method of allocation as above was used for selection of the health workers (doctors and nurses) in accordance with the inclusive and exclusive criteria. A list of the qualified health workers in each department was obtained and used for the selection of the health workers

There were 233 health workers and 267 adult hospitalized patients successfully recruited into the study from the different study sites.

3.10 Data collection Technique and tools

A quantitative approach was adopted for this research. A close ended questionnaire and modified validated risk assessment tool were used for assessing level of risk of VTE in hospitalized patients. The questionnaire was structured in a way that sought relevant information on knowledge and practice of VTE and its prevention for participating health workers. The questionnaire was used to collect information from health workers on individual factors [Demographic characteristics (Age, Sex, length of service) and health workers awareness (knowledge on VTE)]; attitude toward VTE [perception of VTE known to health workers] and practice of VTE prevention [preventive and therapeutic methods on VTE].

Measuring the knowledge level of health workers on DVT/VTE, sets of closed ended questions were used to assess their level on knowledge. Respondents were to choose the right answers to each question and a mark was assigned to them for each correct answer accordingly and their total scores were latter scaled to percentage and then categorized into Poor (less than 50.0%), Medium or Moderate (50.0 – 79.9 %) and High (80.0% or greater). A wrong answer attracted zero points while correct ones attracted one mark each.

A modified Caprini VTE risk assessment tool designed by a Ministry of Health-based Expert Committee was used to assess the level of risk of VTE in hospitalized adult patients. The modification sought to simplify the Caprini risk assessment tool and made it more practical and easier to administer in the Ghanaian hospital setting as well as to categorize the score to risk profile groups of low, moderate and severe risk groups. To administer the questionnaire, the researcher after getting approval consent from the health workers

administered them one at a time, face to face and in the preferred setting of the participants. The completed questionnaire and risk assessment tool were analyzed using STATA 15.

3.11 Quality Control

Proper quality assurance procedures and precautions were taken to ensure the reliability and validity of the data. The researcher selected three research assistants that had public health background and adequate training were given to them. The content of the training included; data collection techniques, hospital entry ethics, translation of questionnaire into various local languages (for patients) and data collection ethical guidelines. The principal researcher was part of the team during the entire questionnaire administration to ensure that relevant information in line with the objectives of the study was captured. The questionnaire was checked for errors and completeness before final entry into appropriate software (STATA) for statistical analysis.

3.12 Data Processing and Analysis

Data from the questionnaire was entered into STATA Version 15 for cleaning, merging and analysis. Cleaning of the data was done by running frequencies of the variables. This checked inconsistently coded data. Inconsistently coded data were double checked with raw data from the questionnaire. Simple proportions and means were used to describe categorical and numerical data, respectively.

The association between the health workers' knowledge, attitude, practices and the profession, department, rank and duration of practice of health workers; as well as between patients' VTE risk profile (prevalence of risk of VTE) and patients' specialty or

department of hospitalization were analyzed using the simple logistic regression analysis. Chi square and/or cross tabulation was used to estimate health workers knowledge, attitude, practices and preventive measures of VTE prevention. Kruskal-Wallis test was done to measure the strength of association between more than two independent variables and dependent variables. A confidence interval of 95% was used to show significant relations between the dependent variable and the independent variables.

3.13 Pretesting

Pretesting of data collections tools was done at Korle Bu Polyclinic with 30 participants (15 hospitalized adult patients and 15 health workers) to validate survey tools. The purpose was to establish if the tool is clearly worded and devoid of major biases and can seek the type of information intended. Pretesting was also carried out with the aim of eliminating irrelevant questions so as to make it reliable.

3.14 Ethical Consideration

Introductory letter was obtained from the Department of Health Policy, Planning and Management (HPPM) of the School of Public Health (SPH) to Research and Training Unit of Korle Bu Teaching Hospital for permission prior to the study. Appropriate courtesy was extended to the unit heads and in-charge nurses of the relevant department prior to commencement of the study. The proposal was then submitted to the HPPM Department of the School of Public Health who then forwarded it for clearance from Korle Bu Teaching Hospital IRB for ethical clearance.

Participation in this study was entirely voluntary and participants had the option not to participate or to discontinue their participation without any adverse consequence. Participants were given sufficient information about the study to enable them decide whether to take part or not. Participants were assured of the fact that this work is purposely academic and that no harm was intended.

The study did not enquire any major cost for participants except the participants' time that was spent in answering the questionnaire. Written informed consent forms were given to participants to sign. All informed consent was in English. However, consents form was read out to patients who were not literate in English in a local language of patient's choice and verbal consent was also be obtained from them.

CHAPTER FOUR

RESULTS

4.1. Introduction

The findings as well as the analyses of the data obtained from this study are chronicled in this chapter. These include descriptive statistics on the demography of study participants and inferential statistics including comparisons of associations between dependent and independent variables. The results are presented in tables and graphs and include the knowledge of health workers on VTE; perceptions and self-reported practices of the health workers pertaining to venous thrombo-embolism; and relationship between knowledge and self-reported practices. It also includes the determination and distribution of the VTE risk profile and the prevalence of different levels of VTE risk in KBTH.

4.2 Demographic Characteristics of Health Worker Respondents

A total of 233 health care providers were recruited into the study of which 42.1% were doctors and 57.9% nurses. The median age of the respondents was 32 years with doctors having a median age of 34 and a median age of 30 years for nurses. Females formed the major sex group however most (63.3%) of the doctors were males but females formed majority of the nurses (84.4%). About one-fifth of the respondents were from the Obstetric, Internal Medicine and Surgery each. Approximately 4 of every 10 selected health worker had 6 to 10 years of working experience. The details of the demographic characteristics of health worker study participants are contained in Table 4.1.

Table4.1 : Demographic characteristics of health workers by profession at KBTH (N=233)

		Profession	
	Total (%)	**Doctor (%) *n*=98**	**Nurse (%),*n*=135**
Age: Median (LQ,UQ)	32(29,36)	34(32,40)	30(28,33)
Sex			
Male	83(35.62)	62(63.27)	21(15.56)
Female	150(64.38)	36(36.73)	114(84.44)
Department			
Internal medicine	48(20.6)	20(20.41)	28(20.74)
Surgery	49(21.03)	20(20.41)	29(21.48)
OBGY	52(22.32)	20(20.41)	32(23.7)
Accident centre	41(17.6)	18(18.37)	23(17.04)
Anesthesia ICU	43(18.45)	20(20.41)	23(17.04)
Years of clinical practice			
1-3years	69(29.61)	10(10.2)	59(43.7)
4-5years	28(12.02)	14(14.29)	14(10.37)
6-10years	89(38.2)	44(44.9)	45(33.33)
11-20years	30(12.88)	21(21.43)	9(6.67)
>20years	16(6.87)	8(8.16)	8(5.93)

% represents column percentages

Source: Computed from field data, 2018

4.3 Health Worker Respondents' knowledge on DVT/VTE

The overall mean knowledge score on DVT/VTE of the health workers was 51.8%. The lowest score was 0% and the highest was 94.1%. The proportion of respondents with high knowledge on DVT/VTE (≥ 80%) was 6.9% (*n*=16), moderate knowledge (50-79.99%) was 48.5% (*n*=113), and approximately 44.6% (*n*=104) had low knowledge (had less than 50%). The average score of the doctors was significantly higher than that of the nurses (68.0% vs. 40.1%, $p<0.001$). Figure 4.1 illustrates the distribution of overall level of knowledge of health worker respondents on VTE by profession (doctors and nurses).

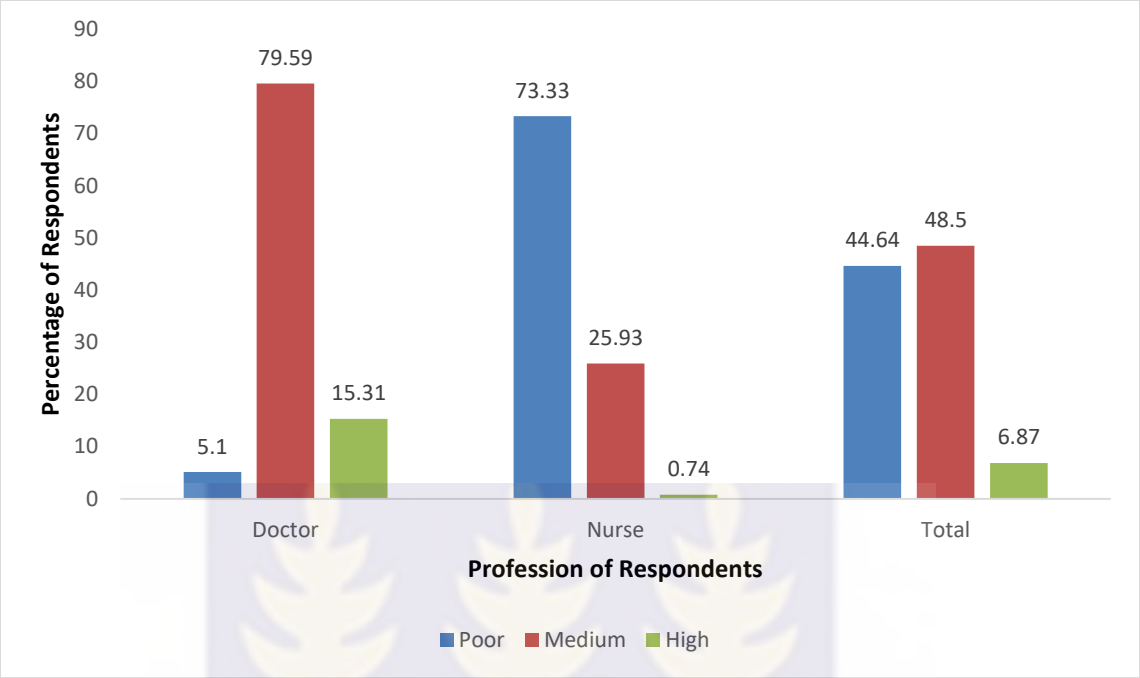

Figure 4.1 Distribution of knowledge of VTE among health worker groups in KBTH

4.4 Association between Demographic Characteristics and Knowledge Level of Doctors at KBTH on VTE

Among only doctors, the proportion of respondents with low knowledge on DVT/TVE was 5%, Moderate – 79.6% and High – 15.3%. Statistically significant association was found between knowledge level and the department of belonging. Though those in the Accident center, Trauma &Orthopaedics and Anesthesia/ICU recorded the highest proportions of doctors with high level of knowledge on DVT/VTE, they were the only departments with respondents having low knowledge on DVT/VTE ($p<0.05$). Rank of the doctors was also significantly associated with their level of knowledge on DVT/VTE ($p=0.025$). Senior specialists/ consultants recorded the highest proportion of high knowledge level among doctors and had nobody recording low knowledge level on DVT/VTE. Years of practice had no significant association with the health care givers knowledge on DVT/VTE

(p>0.05). The association between demographic characteristics and knowledge level of doctors at KBTH is shown in Table 4.2.

Table 4.2: Association between demographic characteristics and knowledge level of Doctors at KBTH

	Knowledge level			Fishers' exact
	Poor	**Moderate**	**High**	**p-value**
Department				**0.034***
Internal medicine	0(0)	18(90)	2(10)	
Surgery	0(0)	18(90)	2(10)	
Obstetrics	0(0)	19(95)	1(5)	
Accident, Trauma& Ortho	2(11.11)	11(61.11)	5(27.78)	
Anesthesia & ICU	3(15)	12(60)	5(25)	
Rank				**0.025***
Specialists/ Con	0(0)	15(78.95)	4(21.05)	
Residents/ SMO	1(1.69)	50(84.75)	8(13.56)	
MO	4(22.22)	11(61.11)	3(16.67)	
Years of practice				0.100
1-3years	3(30)	5(50)	2(20)	
4-5years	1(7.14)	11(78.57)	2(14.29)	
6-10years	1(2.27)	36(81.82)	7(15.91)	
11-20years	0(0)	17(80.95)	4(19.05)	
>20years	0(0)	8(100)	0(0)	

*: p<0.05, **: p<0.01, ***: p<0.001

Source: Computed from field data, 2018

4.5 Association between Demographic Characteristics and Knowledge Level of Nurses at KBTH on VTE

Among Nurses, proportion of nurses with high knowledge was 0.7%, moderate – 25.9%, Low- 73.3%. No significant association was identified between knowledge of nurses on DVT/VTE and department of work, rank of nurses, and years of clinical practical

(p>0.05). The association between the demography of nurses in KBTH and level of knowledge is shown in Table 4.3.

Table 4.3: Association between demographic characteristics and knowledge level of Nurses at KBTH

	Knowledge level			Fishers' exact
	Poor	**Medium**	**High**	**p-value**
Department				0.221
Internal medicine	21(75)	7(25)	0(0)	
Surgery	21(72.41)	8(27.59)	0(0)	
OBGY	27(84.38)	5(15.63)	0(0)	
Accident centre	17(73.91)	5(21.74)	1(4.35)	
Anesthesia ICU	13(56.52)	10(43.48)	0(0)	
Rank				0.588
PNO/ PMIDO	6(66.67)	3(33.33)	0(0)	
SNO/ SMIDO	10(62.5)	6(37.5)	0(0)	
NO/ MIDO	24(64.86)	12(32.43)	1(2.7)	
SSN/ SSMID	6(75)	2(25)	0(0)	
SN/ SMID	44(81.48)	10(18.52)	0(0)	
SHAC/ HAC	7(77.78)	2(22.22)	0(0)	
Years of practice				0.199
1-3years	46(77.97)	12(20.34)	1(1.69)	
4-5years	12(85.71)	2(14.29)	0(0)	
6-10years	30(66.67)	15(33.33)	0(0)	
11-20years	4(44.44)	5(55.56)	0(0)	
>20years	7(87.5)	1(12.5)	0(0)	

*: p<0.05, **: p<0.01, ***: p<0.001

Source: Computed from field data, 2018

4.6 Health Worker Respondents Knowledge on Selected VTE Practice-Related Questions

Table 4.4 presents the responses of health workers to specific practice-related questions on knowledge of DVT/VTE by department. There was an acceptably good (74.7%) proportion of respondents with accurate knowledge of the most important mechanisms for DVT/ VTE

overall, with comparable proportions across departments. Knowledge of the treatment modalities for VTE showed a mixture of poor knowledge for Heparin only (48.5%), moderate knowledge for IVC filters (56.2%) and Embolectomy (65.7%) and high knowledge for Heparin + Warfarin (81.2%). The knowledge level on treatment modalities was also comparable across departments except for Embolectomy where Anaesthesia& ICU (79.1%) and Accident, Trauma &Orthopaedics (78.1%) health workers are more knowledgeable ($p<0.05$). Less than a fifth of all respondents were knowledgeable on the safety duration for stopping prophylactic unfractionated heparin prior to surgery or invasive procedures and only 36.5% on the safety duration for stopping prophylactic LMWH prior to surgery or invasive procedures. There was statistically significant difference in departmental knowledge level regarding the safety duration of prophylactic unfractionated heparin ($p<0.05$) but not for safety duration of prophylactic LMWH. Only a fifth of all respondent were accurately aware of the mortality burden of VTE on hospitalized adult patients and this was comparable across departments.

Table 4.4: Knowledge of Health worker respondents on selected practice-related questions by department

		Department						
	Total	**Int. Med**	**Surgery**	**Obstetrics**	**Accident**	**Anes/ICU**	χ^2	**p-value**
Mechanism of DVT/ VTE risk							1.42	0.841
Wrong	59(25.32)	14(29.17)	12(24.49)	15(28.85)	9(21.95)	9(20.93)		
Correct	174(74.68)	34(70.83)	37(75.51)	37(71.15)	32(78.05)	34(79.07)		
Stop UFH before surgery							14.61	**0.006****
Wrong	189(81.12)	44(91.67)	35(71.43)	48(92.31)	32(78.05)	30(69.77)		
Correct	44(18.88)	4(8.33)	14(28.57)	4(7.69)	9(21.95)	13(30.23)		
VTE Treatment Modalities: Heparin only							4.6	0.331
Wrong	120(51.5)	25(52.08)	28(57.14)	29(55.77)	22(53.66)	16(37.21)		
Correct	113(48.5)	23(47.92)	21(42.86)	23(44.23)	19(46.34)	27(62.79)		
Heparin + Warfarin							2.22	0.696
Wrong	44(18.88)	6(12.5)	9(18.37)	10(19.23)	10(24.39)	9(20.93)		
Correct	189(81.12)	42(87.5)	40(81.63)	42(80.77)	31(75.61)	34(79.07)		
IVC Filters							8.15	0.086
Wrong	102(43.78)	25(52.08)	20(40.82)	28(53.85)	17(41.46)	12(27.91)		
Correct	131(56.22)	23(47.92)	29(59.18)	24(46.15)	24(58.54)	31(72.09)		
Embolectomy							14.06	**0.007****
Wrong	80(34.33)	21(43.75)	15(30.61)	26(50)	9(21.95)	9(20.93)		
Correct	153(65.67)	27(56.25)	34(69.39)	26(50)	32(78.05)	34(79.07)		
Stopping LMWH bef surgery							7.83	0.098
Wrong	148(63.52)	35(72.92)	34(69.39)	35(67.31)	20(48.78)	24(55.81)		
Correct	85(36.48)	13(27.08)	15(30.61)	17(32.69)	21(51.22)	19(44.19)		
VTE Mortality in Hos patients							8.86	0.065
Wrong	185(79.4)	33(68.75)	41(83.67)	46(88.46)	29(70.73)	36(83.72)		
Correct	48(20.6)	15(31.25)	8(16.33)	6(11.54)	12(29.27)	7(16.28)		

χ^2 :Pearson Chi-square,*: p<0.05, **: p<0.01, ***: p<0.001, %: column percentage

Table 4.5 presents the responses of health worker respondents to specific practice-related questions on knowledge on DVT/VTE by profession (doctors and nurses). Doctors are statistically significantly more knowledgeable than nurses on the knowledge of the most important mechanisms of DVT/ VTE ($p<0.001$); all the VTE treatment modalities ($p<0.01$); safety duration for stopping prophylactic unfractionated heparin prior to surgery or invasive procedures ($p<0.001$); safety duration for stopping prophylactic LMWH before surgery or invasive procedures ($p<0.001$) and VTE mortality among hospitalized adults ($p<0.05$).

Table 4.5: Health workers knowledge on selected practice-related questions by profession

		Profession			
	Total	**Doctor**	**Nurse**	**Chi-square**	**p-value**
Mechanisms of DVT/VTE risk				17.78	**<0.001*** **
Wrong	59(25.32)	11(11.22)	48(35.56)		
Correct	174(74.68)	87(88.78)	87(64.44)		
Stopping unfractionated heparin before surgery				43.69	**<0.001*** **
Wrong	189(81.12)	60(61.22)	129(95.56)		
Correct	44(18.88)	38(38.78)	6(4.44)		
VTE Treatment Modalities:					
Heparin only				6.33	**0.012***
Wrong	120(51.5)	41(41.84)	79(58.52)		
Correct	113(48.5)	57(58.16)	56(41.48)		
Heparin + warfarin				10.39	**0.001****
Wrong	44(18.88)	9(9.18)	35(25.93)		
Correct	189(81.12)	89(90.82)	100(74.07)		
IVC filters				55.7	**<0.001*** **
Wrong	102(43.78)	15(15.31)	87(64.44)		
Correct	131(56.22)	83(84.69)	48(35.56)		
Embolectomy				19.13	**<0.001*** **
Wrong	80(34.33)	18(18.37)	62(45.93)		
Correct	153(65.67)	80(81.63)	73(54.07)		
Stopping prophylactic LMWH before surgery				20.07	**<0.001*** **
Wrong	148(63.52)	46(46.94)	102(75.56)		
Correct	85(36.48)	52(53.06)	33(24.44)		
VTE Mortality in hospitalized adult patients				5.00	**0.025***
Wrong	185(79.4)	71(72.45)	114(84.44)		
Correct	48(20.6)	27(27.55)	21(15.56)		

*: p<0.05, **: p<0.01, ***: p<0.001, %: column percentage

There was no association between the rank of doctors and their knowledge of any of the practice-related questions on mechanisms, treatment, safety and mortality burden of VTE in adult hospitalized patients. The details of the association between ranks of doctors and the knowledge of selected practice-related questions on VTE are presented in Table 4.6.

Table 4.6: Knowledge of doctors on selected practice-related questions by rank of doctors

	Doctors Rank					
	Snr. Spec	**Residents**	**MO**	**Total**	**Chi-square**	***p*-value**
Mechanisms of DVT/VTE risk						0.076 Ψ
Wrong	0(0)	7(11.86)	4(22.22)	11(11.46)		
Correct	19(100)	52(88.14)	14(77.78)	85(88.54)		
Stopping UFH before surgery					5.86	0.053
Wrong	7(36.84)	38(64.41)	13(72.22)	58(60.42)		
Correct	12(63.16)	21(35.59)	5(27.78)	38(39.58)		
VTE Treatment Modalities						
Heparin only					1.32	0.516
Wrong	6(31.58)	25(42.37)	9(50)	40(41.67)		
Correct	13(68.42)	34(57.63)	9(50)	56(58.33)		
Heparin plus warfarin					3.37	0.186
Wrong	0(0)	5(8.47)	3(16.67)	8(8.33)		
Correct	19(100)	54(91.53)	15(83.33)	88(91.67)		
IVC filters						0.776 Ψ
Wrong	2(10.53)	10(16.95)	2(11.11)	14(14.58)		
Correct	17(89.47)	49(83.05)	16(88.89)	82(85.42)		
Embolectomy						0.466 Ψ
Wrong	5(26.32)	10(16.95)	2(11.11)	17(17.71)		
Correct	14(73.68)	49(83.05)	16(88.89)	79(82.29)		
Stopping LMWH before surgery					2.59	0.274
Wrong	6(31.58)	31(52.54)	8(44.44)	45(46.88)		
Correct	13(68.42)	28(47.46)	10(55.56)	51(53.13)		
VTE mortality in hospitalized adults					0.41	0.815
Wrong	13(68.42)	43(72.88)	14(77.78)	70(72.92)		
Correct	6(31.58)	16(27.12)	4(22.22)	26(27.08)		

Ψ:p-value estimated from Fisher's exact test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

Table 4.7 presents the association between knowledge of selected practice-related questions and rank of nurses.PNO/PMID and NO/MIDO ranks were statistically significantly more knowledgeable than other ranks on the knowledge of the use of Heparin only, as a modality of VTE treatment ($p<0.05$).

Table 4.7: Knowledge of nurses on selected practice-related questions by rank of nurses

		Nurse Rank							
	Total	**PNO/ PMID**	**SNO/ SMID**	**NO/ MIDO**	**SSN/ SSMI**	**SN/ SMID**	**SHAC/ HAC**	**chi-square**	**p-value**
Mechanisms of DVT/VTE risk								2.07	0.839
Wrong	47(35.34)	2(22.22)	7(43.75)	14(37.84)	2(25)	18(33.33)	4(44.44)		
Correct	86(64.66)	7(77.78)	9(56.25)	23(62.16)	6(75)	36(66.67)	5(55.56)		
Stopping UFH bef surgery								2.67	0.75
Wrong	127(95.49)	9(100)	15(93.75)	36(97.3)	8(100)	50(92.59)	9(100)		
Correct	6(4.51)	0(0)	1(6.25)	1(2.7)	0(0)	4(7.41)	0(0)		
VTE Treatment Modalities:									
Heparin only								11.32	**0.045**
Wrong	78(58.65)	4(44.44)	11(68.75)	14(37.84)	6(75)	37(68.52)	6(66.67)		
Correct	55(41.35)	5(55.56)	5(31.25)	23(62.16)	2(25)	17(31.48)	3(33.33)		
Heparin plus warfarin								9.79	0.081
Wrong	34(25.56)	6(66.67)	4(25)	9(24.32)	1(12.5)	11(20.37)	3(33.33)		
Correct	99(74.44)	3(33.33)	12(75)	28(75.68)	7(87.5)	43(79.63)	6(66.67)		
IVC filters								2.8	0.731
Wrong	85(63.91)	5(55.56)	10(62.5)	23(62.16)	5(62.5)	34(62.96)	8(88.89)		
Correct	48(36.09)	4(44.44)	6(37.5)	14(37.84)	3(37.5)	20(37.04)	1(11.11)		
Embolectomy								9.94	0.077
Wrong	62(46.62)	4(44.44)	5(31.25)	12(32.43)	5(62.5)	29(53.7)	7(77.78)		
Correct	71(53.38)	5(55.56)	11(68.75)	25(67.57)	3(37.5)	25(46.3)	2(22.22)		
Stopping LMWH bef surgery								2.42	0.788
Wrong	100(75.19)	6(66.67)	13(81.25)	25(67.57)	6(75)	43(79.63)	7(77.78)		
Correct	33(24.81)	3(33.33)	3(18.75)	12(32.43)	2(25)	11(20.37)	2(22.22)		
VTE mortality hospitalized adult patients								6.1	0.296
Wrong	113(84.96)	8(88.89)	16(100)	30(81.08)	6(75)	44(81.48)	9(100)		
Correct	20(15.04)	1(11.11)	0(0)	7(18.92)	2(25)	10(18.52)	0(0)		

%: column percentage. * p <0.05, ** p<0.01, *** p<0.001

4.7 Practices of health professionals about VTE prophylaxis

In assessing the practices of health professionals about VTE prophylaxis, of the 98.7% of the health professionals thought VTE prophylaxis was clinically important. Compared to the doctors, a higher proportion of the nurses thought that DVT/VTE is symptomatic among most patience (21.4% vs. 39.26%, $p<0.001$).

A high proportion (99.0%) of the doctors self-reported to have ever prescribed VTE prophylaxis which was as expected, far higher than the 5.2% of the nurses who self-reported to have prescribed VTE prophylaxis before ($p<0.001$). Among the health professionals who said they have prescribed prophylaxis before, 46.2% of them self-reported to have prescribed Unfractionated heparin prophylaxis modalities, 94.2% self-reported to have prescribed low molecular weight heparin (LMWH), 74.0% self-reported to have prescribed anti-embolic stockings and 33.7% of them self-reported to have prescribed intermittent compressive devices before. The practices of health worker participants on VTE by profession are presented in Table 4.8.

Table 4.8: Practices of health workers on VTE prophylaxis by profession

	Total	Profession		Chi-square	*p*-value
		Doctor	Nurse		
Clinically Important					0.510Ψ
Yes	229(98.71)	98(100)	131(97.76)		
No	2(0.86)	0(0)	2(1.49)		
DK	1(0.43)	0(0)	1(0.75)		
VTE Symptomatic?				17.97	**<0.001*** **
Yes	74(31.76)	21(21.43)	53(39.26)		
No	146(62.66)	76(77.55)	70(51.85)		
DK	13(5.58)	1(1.02)	12(8.89)		
Prescribes Thromboprophylaxis				201.17	**<0.001*** **
Yes	104(44.83)	97(98.98)	7(5.22)		
No	128(55.17)	1(1.02)	127(94.78)		
Prescription Frequency					0.291 Ψ
Routinely	42(40.78)	40(41.67)	2(28.57)		
Most of the time	43(41.75)	40(41.67)	3(42.86)		
Occasionally	15(14.56)	14(14.58)	1(14.29)		
Rarely	3(2.91)	2(2.08)	1(14.29)		
Modalities Prescribed:					
Unfractionated Heparin					0.447 Ψ
Yes	48(46.15)	46(47.42)	2(28.57)		
No	56(53.85)	51(52.58)	5(71.43)		
LMWH					0.349 Ψ
Yes	98(94.23)	92(94.85)	6(85.71)		
No	6(5.77)	5(5.15)	1(14.29)		
Anti-Embolic Stockings					**0.012* Ψ**
Yes	77(74.04)	75(77.32)	2(28.57)		
No	27(25.96)	22(22.68)	5(71.43)		
ICDs					0.419 Ψ
Yes	35(33.65)	34(35.05)	1(14.29)		
No	69(66.35)	63(64.95)	6(85.71)		

Ψ:p-value estimated from Fisher's exact test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

Source: Computed from field data, 2018

4.8 Availability of Departmental Policies on VTE Assessment and Management

Less than half of the respondents, 104 (44.6%) responded to this question with half of them indicating that VTE policies were available in their department whereas the other half disagreed with (32.7%) or did not know (17.3%). Over half (55.4%) of the participant did not respond to this question, and most of these were nurses (128). Details of the self-reported availability of departmental policies on VTE by the health worker respondents are captured in Table 4.9.

Table 4.9: Availability of departmental policies on VTE

	Profession			
	Total	Doctor	Nurse	p-value
VTE Policy in department				0.871 Ψ
Yes	52(50)	49(50.52)	3(42.86)	
No	34(32.69)	31(31.96)	3(42.86)	
DK	18(17.31)	17(17.53)	1(14.29)	

Ψ:p-value estimated from Fisher's exact test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

Source: Computed from field data, 2018

4.9 Association between Level of Knowledge of Health Workers and Self-reported Thrombo-prophylaxis Practices

Table 4.10 presents the association between respondents' level of knowledge (poor, moderate and high) and prescriber respondents' self-reported thrombo-prophylaxis practices. There was no statistically significant association between respondents' knowledge level and the self-reported prescription habit and choice of thrombo-prophylaxis prescribed.

Table 4.10: Association between Knowledge of Health Workers and Thrombo-prophylaxis Practices

	Knowledge level				Fishers' exact p-value
	Poor	**Medium**	**High**	**Total**	
Prescription frequency					0.680
Routinely	1(25)	31(40.26)	8(53.33)	40(41.67)	
Most of the time	2(50)	34(44.16)	4(26.67)	40(41.67)	
Occasionally	1(25)	10(12.99)	3(20)	14(14.58)	
Rarely	0(0)	2(2.6)	0(0)	2(2.08)	
Thrombo-prophylaxis prescribed: Unfractionated Heparin					0.842
Yes	2(50)	38(48.72)	6(40)	46(47.42)	
No	2(50)	40(51.28)	9(60)	51(52.58)	
LMWH					1.000
Yes	4(100)	74(94.87)	14(93.33)	92(94.85)	
No	0(0)	4(5.13)	1(6.67)	5(5.15)	
Anti-Embolic Stockings					0.789
Yes	4(100)	59(75.64)	12(80)	75(77.32)	
No	0(0)	19(24.36)	3(20)	22(22.68)	
ICDs					0.686
Yes	2(50)	26(33.33)	6(40)	34(35.05)	
No	2(50)	52(66.67)	9(60)	63(64.95)	

%: column percentage. * p <0.05, ** p<0.01, *** p<0.001

4.10 Demographic Characteristics of Hospitalized Patient Participants

267 patients admitted in five departments or units were successfully recruited into the study of which more than half (56.9%) were females. The median age of participating patients was 38 years with twenty-five 25% of participants aged at most 29 years and an upper quartile age of 59 years. About two-third of participants had at most SHS/ O-level/ A-level as their highest level of education. Christianity was the commonest (87.3%) religion among the study participants. About half of the participants were in admission in either Internal Medicine (25.8%) or surgical wards (22.9%). 50% of patients had been on admission for at most 6 days at the time of the study. This is presented in Table 4.11.

Table 4.11: Demographic Characteristics of Adult Hospitalized Patients

	Frequency	Percent
Age: Median(LQ,UQ)	38(29,59)	
Sex		
Male	115	43.07
Female	152	56.93
Highest Educational level		
Uneducated	19	7.12
less than SHS	84	31.46
SHS/O-LEVEL/A-LEVEL	82	30.71
Tertiary	58	21.72
Post-tertiary	5	1.87
Religion		
Christianity	233	87.27
Islam	28	10.49
Traditional	1	0.37
No response	1	0.37
Department of hospitalization		
Internal Medicine	69	25.84
Surgery	61	22.85
Obstetrics	55	20.6
Accident, Trauma and Orthopaedics	39	14.61
Intensive Care Units	43	16.1
Admission duration: Median(LQ,UQ)	6(3,12)	

LQ: Lower quartile, UQ: Upper quartile

4.11 Hospitalized Patients' Current and Previous History of VTE and Thrombo-prophylaxis Management

Table 4.12 presents patient participants current and previous history of VTE, and their thrombo-prophylaxis management information. In all, 4.2% of patients participating in the study had a personal history of VTE; whiles 2.75% of them also indicated a positive family history of VTE. The commonest thrombo-prophylactic modality currently being received by the study participants was LMWH with about one-third of all participants currently on it. There was no patient currently using ICD, although a single patient currently admitted in the surgical ward had previously used it. There was minimal previous history of thrombo-prophylaxis among the study participants with Anti-embolic stockings (7.12%) and LMWH (6.37%) being the commonest modalities previously used.

There was statistically significant departmental variation in the current administration of thrombo-prophylaxis to the hospitalized patient participants with a significantly higher proportion of patients admitted in the ICU receiving mechanical thrombo-prophylaxis (Anti-embolic stockings, 86.1% of participants, χ^2 = 121.67, p<0.001) and the pharmacological thrombo-prophylaxis LMWH (74.4% of participants, χ^2 = 62.81, p<0.001) compared to less than half of the participants in all the departments for either modality.

The commonest reason for many respondents not using receiving thrombo-prophylaxis was due to the fact that it was not prescribed for them. Details of the distribution of medical management information of study participant by department of admission can be found in Table 4.12.

Table 4.12: Current and Previous History of VTE and Thromboprophylaxis Management of Hospitalized Patients by Department

		Department						
	Total	**Int. Med**	**Surgery**	**Obstetric**	**Accident**	**ICU**	**chi-square**	**p-value**
Personal history of DVT/ VTE								
Yes	11(4.15)	4(5.97)	3(4.92)	0(0)	0(0)	4(9.3)		0.077 Ψ
No	254(95.85)	63(94.03)	58(95.08)	55(100)	39(100)	39(90.7)		
Family history of DVT/ VTE								
Yes	7(2.67)	1(1.49)	2(3.28)	1(1.85)	0(0)	3(7.14)		0.057 Ψ
No	154(58.78)	31(46.27)	42(68.85)	31(57.41)	27(71.05)	23(54.76)		
Don't Know	101(38.55)	35(52.24)	17(27.87)	22(40.74)	11(28.95)	16(38.1)		
Currently receiving thrombo-prophylaxis								
Anti-embolic stockings								
Yes	76(28.46)	2(2.9)	28(45.9)	1(1.82)	8(20.51)	37(86.05)	121.67	**<0.001*** **
No	191(71.54)	67(97.1)	33(54.1)	54(98.18)	31(79.49)	6(13.95)		
ICD								
No	267(100)	69(100)	61(100)	55(100)	39(100)	43(100)		
Unfractionated Heparin								
Yes	14(5.24)	6(8.7)	1(1.64)	6(10.91)	0(0)	1(2.33)		**0.046*** Ψ
No	253(94.76)	63(91.3)	60(98.36)	49(89.09)	39(100)	42(97.67)		
LMWH								
Yes	88(32.96)	25(36.23)	22(36.07)	0(0)	9(23.08)	32(74.42)	62.81	**<0.001****
No	179(67.04)	44(63.77)	39(63.93)	55(100)	30(76.92)	11(25.58)		

Ψ:p-value estimated from Fisher's exact test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

Table 4.12 cont': Current and Previous History of VTE and Thromboprophylaxis Management of Hospitalized Patients by Department

		Department						
	Total	**Int. Med**	**Surgery**	**Obstetric**	**Accident**	**ICU**	**chi-square**	**p-value**
Previously received thromboprophylaxis: Anti-embolic Stockings							50.95	**<0.001*** Ψ**
Yes	19(7.12)	2(2.9)	4(6.56)	0(0)	0(0)	13(30.23)		
No	188(70.41)	46(66.67)	48(78.69)	38(69.09)	30(76.92)	26(60.47)		
Don't Know	60(22.47)	21(30.43)	9(14.75)	17(30.91)	9(23.08)	4(9.3)		
ICD								**0.026* Ψ**
Yes	1(0.37)	0(0)	1(1.64)	0(0)	0(0)	0(0)		
No	206(77.15)	48(69.57)	51(83.61)	38(69.09)	30(76.92)	39(90.7)		
Don't Know	60(22.47)	21(30.43)	9(14.75)	17(30.91)	9(23.08)	4(9.3)		
Unfractionated Heparin								**0.013* Ψ**
Yes	6(2.25)	0(0)	1(1.64)	3(5.45)	0(0)	2(4.65)		
No	201(75.28)	48(69.57)	51(83.61)	35(63.64)	30(76.92)	37(86.05)		
Don't Know	60(22.47)	21(30.43)	9(14.75)	17(30.91)	9(23.08)	4(9.3)		
LMWH							29.58	**<0.001*** **
Yes	17(6.37)	7(10.14)	1(1.64)	0(0)	1(2.56)	8(18.6)		
No	190(71.16)	41(59.42)	51(83.61)	38(69.09)	29(74.36)	31(72.09)		
Know	60(22.47)	21(30.43)	9(14.75)	17(30.91)	9(23.08)	4(9.3)		
History of bleeding complication								**<0.001*** Ψ**
Yes	5(2.02)	1(1.56)	2(3.64)	1(2)	1(2.7)	0(0)		
No	174(70.16)	42(65.63)	42(76.36)	23(46)	29(78.38)	38(90.48)		
Don't Know	69(27.82)	21(32.81)	11(20)	26(52)	7(18.92)	4(9.52)		
Reason for not receiving thrombo-prophylaxis								**0.048* Ψ**
Not prescribed	62(60.19)	12(52.17)	13(72.22)	22(51.16)	15(78.95)	-		
Refused to receive	1(0.97)	0(0)	0(0)	0(0)	1(5.26)	-		
can't afford	1(0.97)	0(0)	1(5.56)	0(0)	0(0)	-		
Other	1(0.97)	0(0)	0(0)	1(2.33)	0(0)	-		
Don't know	38(36.89)	11(47.83)	4(22.22)	20(46.51)	3(15.79)	-		

Ψ:p-value estimated from Fisher's exact test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

4.12 DVT/VTE Risk Assessment, Total Risk Score and Risk Profile/ Prevalence

DVT/ VTE risk factor assessment findings of study participants are shown in Table 4.13. Overall, half of the study respondents recorded a maximum of 4 as total risk score with 75% of the participants having a total VTE risk score higher than 3. 25% of participants' total risk score was higher than 7. A departmental comparison shows that, respondents on admission at ICU had the highest median total risk score of 7 points with 25% of the participants on admission at the ICU obtaining total risk score higher than 9. The risk scores were significantly different across the various departments of admission (p<0.001). In all, about 47.2% of all participants had a high risk for VTE with the ICU patients having statistically significant higher proportion (76.7%) of patients with high VTE risk level (p<0.001). Details of the total VTE risk factor score and risk profile of patient study participants can be found in the table.

Table4.13: Total VTE Risk Factor Score and Risk Profile of Adult Hospitalized Patients by Department

		Department						
Risk Assessment	**Total**	**Medicine**	**Surgery**	**Obstetrics**	**Accident**	**ICU**	**χ^2**	**p-value**
Total Risk Factor Score								
Median(LQ,UQ)	4(3, 7)	4(2, 7)	4(3, 6)	3(2, 4)	6(3, 7)	7(5, 9)	54.84	**<0.001*** Ψ**
Risk Profile/ Prevalence								
Low	53(19.85)	18(26.09)	6(9.84)	21(38.18)	8(20.51)	0(0)	53.33	**<0.001*** **
Moderate	88(32.96)	20(28.99)	25(40.98)	26(47.27)	7(17.95)	10(23.26)		
High	126(47.19)	31(44.93)	30(49.18)	8(14.55)	24(61.54)	33(76.74)		

LQ: Lower quartile, UQ: Upper quartile Ψ:p-value estimated from Mann-Whitney test %: column percentage. * p <0.05, ** p<0.01, *** p<0.001

4.13 Association between Hospitalized patients' Risk Profile and Modality of Thrombo-prophylaxis

Overall 28.5% and 33% of participants are currently on anti-embolic stockings and LMWH respectively. None of the low risk patients is on anti-embolic stockings or unfractionated heparin but 6 (11.3%) of the 53 low VTE risk profile patients were on LMWH. Statistically significant higher proportions of high VTE risk patients are currently using both anti-embolic stockings (39.7%, $p<0.001$) and LMWH (46.8%, $p<0.001$). Details of the association between VTE risk profile of participants and their current thrombo-prophylaxis is shown in Table 4.14.

Table 4.14: Association between Adult Hospitalized Patients Risk Profile and Thrombo-prophylaxis Received

		Risk Profile				
	Total	**Low**	**Moderate**	**High**	**Chi-square**	**p-value**
Anti-embolic stockings					28.93	**<0.001****
Yes	76(28.46)	0(0)	26(29.55)	50(39.68)		
No	191(71.54)	53(100)	62(70.45)	76(60.32)		
Unfractionated Heparin					5.61	0.060
Yes	14(5.24)	0(0)	8(9.09)	6(4.76)		
No	253(94.76)	53(100)	80(90.91)	120(95.24)		
LMWH					24.05	**<0.001*****
Yes	88(32.96)	6(11.32)	23(26.14)	59(46.83)		
No	179(67.04)	47(88.68)	65(73.86)	67(53.17)		

%: column percentage., * p <0.05, ** p<0.01, *** p<0.001

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the findings of the study with the intention of addressing the research questions and the specific objectives of the study; on the knowledge, perception and prevention practices of health workers in KBTH on venous thromboembolism as well as the risk profiling of adult hospitalized patients in the hospital. The chapter also compares the findings of this study to other studies conducted in and outside the West African region. Probable reasons contributing to the findings of this study are also discussed in this chapter

5.2 Characteristics of Health Worker Respondents

This study looked at the knowledge and self-reported practices of both doctors (98) and nurses (135) in clinical practice settings unlike other studies that focused on either group of health workers (Bhatti et al, 2012)or which included non-clinical health workers (Makusidiet al, 2016). The focus on both doctors and nurses and concentrating on only adult clinical departments from which the risk profile or prevalence of adult hospitalized patients were assessed was aimed at obtaining a true reflection of the venous thromboembolism knowledge and practice status of the health workers that are actually responsible for the management of these patient and to assess the relationship between the knowledge of the health workers and the current thrombo-prophylactic management of the hospitalized patients.

The choice of five important adult clinical departments, internal medicine, surgery, accident and trauma, and anaesthesia and intensive care made it easy to directly

compare both the knowledge and practice of similar categories of health workers as well as to document a comparative VTE risk stratification in different specialties and diagnostic patient groupings. Majority (79.7%) of the health workers sampled had practiced for 1-10 years reflecting the groups actively involved in the daily clinical management of hospitalized patients. This study excluded house-officers (with minimal clinical experience and no legal clinical responsibility for patient management) and health workers who have not permanently practiced in our hospital in order to obtain a true reflection of the hospital's VTE experience. This is similar to other studies by (Makusidi et al, 2016) and in contrast to other studies by (Bhatti et al, 2012) which included all grades of clinical health workers.

5.3 The knowledge of Health Workers on venous thromboembolism

In measuring health worker knowledge, this study used the total score of all 17 knowledge-based questions scaled to percentage and then categorized as high (≥80%), moderate (50-79%) and low (<50%). This is unlike other studies (Bhatti et al, 2012) that assessed separately the knowledge of individual questions. A similar study by (Makusidi et al, 2016) also used the total knowledge score but comparison was by mean raw score and had fewer knowledge-based questions (nine).

Only 6.9% of all health worker participants in this study had a high VTE knowledge level with the doctors significantly more knowledgeable than the nurses (mean total score of 68.0% vs 40.1%, $p<0.001$). Most (73.3%) of the nurses demonstrated low VTE knowledge level similar to the finding from another study which had a much lower proportion of nurses as respondents (Bhatti et al, 2012). The predominantly low and moderate level of knowledge of health workers on venous thromboembolism is probably due to paucity of regular VTE education and lack of awareness of the

magnitude of the problem of hospital-acquired VTE among health workers in our hospitals. This was also reflected in underestimation of VTE-related mortality among hospitalized adult patients.

Most health workers in our study underestimate the prevalence and consequences of venous thromboembolism in the hospitalized patients partly due to poor knowledge of the risk factors and partly due to the non-availability of uniform hospital policies on risks assessment and management of VTE. This makes it difficult for health workers to have consistent and appropriate practical experience of assessing VTE risk and its management in hospitalized patients, which would have helped in improving and sustaining their knowledge and appropriate patient care.

This study also suggests that even for departments where clinical management policies on VTE assessment and management do exist, they are either not documented or are not easily and visibly accessible to the relevant clinical health workers because there were conflicting responses from health workers from the same department on the availability of departmental policies governing the management of venous thromboembolism. This further supports the prescription for a comprehensive, documented and visible hospital-wide policy.

This study interestingly revealed a significant difference in VTE knowledge among doctors from different departments, with doctors in Accident, Trauma &Orthopaedics and Anaesthesia & ICU showing a much higher proportion of high total score of respondents) compared to doctors from Internal Medicine, Surgery and Obstetrics ($\geq$ 25% vs $\leq$10% of respondents, $p<0.05$). It is, however, also notable that these two departments accounted for all the doctors with low total knowledge score, demonstrating more intra-departmental variability among doctors in these two

departments in VTE knowledge than in the other departments where 90-95% of their doctors demonstrated moderate VTE knowledge levels.

The fact that doctors from Accident, Trauma &Orthopaedics and Anaesthesia and ICU are probably more exposed to the daily requirement to make clinical management decisions (from trauma patient and perioperative and ICU patients respectively) may account for the higher proportion of doctors with high total knowledge score level. It may also have contributed to a state of falsely assumed knowledge by some of the doctors in these two departments accounting for their higher proportion of low-scoring doctors also.

Unsurprisingly, rank of a doctor was found to be significantly related to the knowledge level, with higher proportion of Senior Specialist/ Consultants showing a higher VTE knowledge level compared to Residents and Medical officers (21.1% vs 13.6% vs 16.7% of respondents, $p < 0.05$). However, years of practice in general, did not seem to be significantly affect the VTE knowledge level, although three out of the five doctors with low knowledge level had practiced for 1-3 years whereas none of the doctors with more than 10 years of clinical practice experience were in the low knowledge category.

There were no significant differences found among nurses on their VTE knowledge level due to departmental, rank or years of practice variations. There was a global cross-departmental low knowledge level among nurses on venous thromboembolism in this study similar to the findings in a study by Bhatti et al (2012). Even more interestingly, this study showed that only one nurse at the rank of Nursing Officer (NO), from Accident, Trauma and Orthopaedic department with 1-3 year clinical experience had a high knowledge level total score, whereas, seven out of eight (87.5%) of nurses with more than 20 years of clinical practice obtained low VTE knowledge level scores.

The low knowledge level of these more senior, longer-practicing nurses is probably due to limited clinical work time from more supervisory and administrative roles and lower participation in update courses. This is of concern because these are the same nurses usually entrusted with training and clinical supervision of less experienced nursing subordinates.

5.4 The knowledge of Health Workers on specific practice-related questions

The study further looked at the knowledge of health workers individually on five (5) selected questions which were deemed to be directly related to the application of knowledge to the daily management of patients with respect to VTE prevention, diagnosis and treatment and well as safety of prophylactic interventions. This is important as a check on the self-reported practices of the health worker which may sometimes be inflated. The five (5) questions selected were questions 5,18,19,20 and 21 on the health worker participant's structured questionnaire.

The Virchow's triad of hypercoagulability, circulatory stasis and vascular injury are well recognized as the most important mechanisms for the development of DVT/ VTE (Kumar et al, 2010). Knowledge of the role of these factors or mechanisms in the development of VTE is the institution of appropriate preventive interventions against VTE and in the clinical assessment of individual patient's VTE risk profile in order to appropriately manage them. Impressively, over seven in every ten health worker (74.7%) correctly recognized that all the three (3) mechanisms are important in the development of DVT/ VTE. This is similar to the finding of a study by Makusidi et al, (2016), where 82% of their respondents were knowledgeable on the most important mechanisms of VTE risk.

There are several acceptable modalities for the treatment of VTE depending on the presenting severity, local guideline and availability of expertise and resources involved. These modalities include heparin only, heparin + warfarin, inferior vena cava (IVC) filter insertion and embolectomy (McRae, 2014). Knowledge of respondents on VTE treatment modality showed a mixed picture, with most (81.1%) correctly identifying combined heparin + warfarin as an accepted treatment modality, whereas less than half (48.5%) of the respondents were aware that heparin alone can be used for the treatment of VTE. It is interesting that although IVC filter is available at the National Cardiothoracic Centre (NCTC) of Korle Bu Teaching Hospital, only 56.2% of the health worker respondents were aware that it is a modality for the treatment of VTE. This is probably due to limited accessibility of it to patients due to its inhibitive cost and its target for selected patient groups with higher risk for embolization. This may explain the observation in this study that doctors were much more knowledgeable than nurses on this treatment modality (85% vs 36%, $p<0.001$). The respondents in this study, however, generally seemed to be more knowledgeable than their Pakistani counterparts on the acceptable treatment modalities (Bhatti et al, 2012).

Prophylactic unfractionated heparin with a half-life of 1-5 hours can be safely stopped about six (6) hour prior to surgery or an invasive procedure whereas the longer-acting low molecular weight heparins (LMWH) require a period of about twelve (12) hours after the last prophylactic dose before surgery or an invasive procedure (Krishnaswamy, Lincoff, Cannon, 2010). This knowledge is important to prevent bleeding complication from the administration of prophylactic anticoagulants whilst limiting higher risk of thrombosis from much longer duration of wait. The knowledge of health worker respondents in this study on the safety time margins of both prophylactic unfractionated heparin and prophylactic LMWH was found to be very poor with only 18.9% and

36.5% of the respondents respectively able to demonstrate accurate knowledge. Although this is very similar to findings from another study conducted in five Indian teaching hospitals (Bhatti et al, 2012); it is very worrying because this poor knowledge could probably impact on the management practices of health workers and may expose patients to a higher risk of either bleeding or thrombotic complications.

Approximately 10% of mortality in hospitalized adult patients could be attributed to VTE (Geertset al, 2004; Cohen et al, 2007). This indicates a high mortality burden of the condition and the importance of the assessment of the VTE risk in hospitalized patients, appropriate institution of preventive measures and prompts treatment of patient at high risk or diagnosed with VTE. This study revealed a very low awareness of the mortality due to VTE similar to other studies with even lower awareness of less than 10% (Makusidi et al, 2016; Bhatti et al, 2012). This may contribute to health workers not paying enough attention to thrombo-prophylaxis because of underestimation of the consequences of VTE in the hospitalized patient.

Poor knowledge of the mechanisms, risk factors, treatment modalities, thrombo-prophylaxis safety profile and consequence of inappropriate management of VTE would be expected to impact negatively on the prevention practices and management of VTE by health workers.

5.5 Practices of Health Workers on Venous Thromboembolism

Perception is probably the root on which a lot of practices thrive on. Health workers' perception of clinical importance and presentations of VTE would therefore be expected to influence their preventive practices and their thrombo-prophylaxis habit. This study showed almost perfect (98.7%) perception of thrombo-prophylaxis as being clinically important by health workers across all clinical departments in KBTH. This is

in agreement with other similarly structured studies on VTE knowledge, perception and practices of health workers which showed similarly high perception (Makusidi et al, 2016; Bhatti et al, 2012). This is encouraging as acceptance of the clinical importance of thrombo-prophylaxis is an important platform from which to launch strategies and sustained education aimed at improving the knowledge level of health workers and impact on their preventive practices against hospital-acquired VTE.

Most cases of VTE are asymptomatic with death as the first presentation in a high proportion of cases (Geerts et al, 1994; Elliot, 2000). It is therefore, dangerous to wait for typical symptoms of VTE before treatment and this is the role of risk assessment, risk profiling and appropriate thrombo-prophylaxis in reducing this mortality. Compared to doctors, a significantly higher proportion of nurses in this study wrongly asserted that DVT/ VTE is symptomatic in most hospitalized patients (21.4% vs 39.3%, $p<0.001$); this is in keeping with the finding of Makusidi et al, (2016), which reported 30% wrong perception, but much better than the study by Bhatti et al, (2012) in which more than half of the respondents had the wrong perception. It is important to aim at even further changing this perception of VTE as usually symptomatic and to emphasis the risk posed to patients from delayed thrombo-prophylaxis as they may suddenly develop and die from VTE with any early warning symptoms. This should be based on a validated risk assessment model and clinical criteria or guidelines.

As expected, most of the respondents who self-reported to prescribing thrombo-prophylaxis were doctors (99.0% of doctors vs 5.2% of nurses) reflecting the legal and best practice prescribing responsibilities as pertains in Ghana. The few nurses who admitted prescribing thrombo-prophylaxis are most probably specialist critical care nurses and nurse managers with prescription done under the clinical coverage of their doctors; the prescriptions were for physical thrombo-prophylactic methods such as anti-

embolic stockings. Although most of the prescriber (83.3%) admitted to routine or frequent prescription of thrombo-prophylaxis, there were still almost 17% of prescribers who do not prescribe regularly for hospitalized patients. In this study, this may be partly due to the phenomenon of joint or multidisciplinary care of the hospitalized patient common in a teaching hospital setting e.g. surgical patients who arrive to the theatre and to the anaesthetist with their thrombo-prophylaxis already prescribed by the surgeon.

Low molecular weight heparin (LMWH) is the commonest pharmacological thrombo-prophylaxis prescribed by doctors in KBTH as self-reported by the prescribers in this study. This is usually due to its longer lasting effect with minimal requirement for frequent laboratory test monitoring. It is probably the mainstay thrombo-prophylaxis method in most hospitals in Ghana and the West Africa as shown in the ENDORSE Senegal study (Baet al, 2011). The high self-reported rate of thrombo-prophylaxis prescription does not however, necessarily always reflect in what the hospitalized patient actually receives in practice, because of issues of affordability and nursing care.

It is also worrying that although a third of prescribers reported to prescribing Intermittent Compressive Devices (ICD) or Intermittent Pneumatic Compression (IPC) for hospitalized patients in KBTH, none of the wards studied had it available for their patients at the time of this study. Anti-embolic stockings which are considered less effective for the prevention of DVT in hospitalized, less ambulatory patients were rather available. Here again, cost is a major issue as ICD is about 10-15 times more expensive than anti-embolic stockings. Procurement of these devices by the departments or hospital for each bed and for multiple use with individual disposable cuffs while observing appropriate infection prevention guidelines may be a suitable compromise to improve the availability and adherence with the use of ICD.

There was a mixed response from respondents on availability of departmental policies governing VTE assessment and management with over half (56%) of health workers electing not to respond and half of those who responded either denying the existence of any policy or did not know. This found to cut across all department and profession. This reflects an absence or poor visibility of such policies and a need for a hospital-wide or even Health sector-wide uniform policy on VTE and the need for frequent training and update courses for health workers.

5.6 Categorization, VTE History and Thrombo-prophylactic Management of Adult Hospitalized Patient Participants

Adult hospitalized patients from five (5) different clinical departments deemed to be representative of clinical care in KBTH were profile for VTE risk and the thrombo-prophylaxis information. This was done to obtain findings on VTE risk stratification that can be generalized for the hospital as well as to enable comparison of VTE risk and thrombo-prophylaxis across different adult hospitalization settings. Unlike the ENDORSE Senegal study which broadly categorized hospitalized adult patients into only two (2) groups – Medical and Surgical (Ba et al, 2011), this study in addition went further to other specific specialties – Accident, Trauma &Orthopaedics, Obstetric and ICU. This is because patients in these other setting may have peculiarities that may distinguish them from the broad medical and surgical grouping.

4.2% of the patients in this study had a personal history of VTE which is not much different from the finding of 5.5% in an Australian study (Khalafallahet al, 2016). Thrombo-prophylaxis among hospitalized patients in KBTH was found to be generally very low (less than a third of patients for any method) similar to another study in West

Africa by Ba et al, 2011; which revealed similarly low level of thrombo-prophylaxis coverage for adult hospitalized medical and surgical patients in Senegal. A large multinational study found the rates of thrombo-prophylaxis widely varying from 4-80% and 0.4-94% for any method of thrombo-prophylaxis among at-risk medical and surgical patients, respectively (Cohen, Tapson, Bergmann, et al, 2008)

In spite of the generally low level of thrombo-prophylaxis, this study revealed a statistically significant interdepartmental variation with the ICU demonstrating rather higher levels of thrombo-prophylaxis for both anti-embolic stockings (86.1%) and LMWH (74.4%) compared to lower than half of the patients for each method in the other departments.

The overall low level of thrombo-prophylaxis in KBTH is most probably multi-factorial stemming from, poor VTE knowledge of health workers; lack of awareness or appreciation of the complication and mortality implications of VTE; cost factors; inability to assess VTE risk; and absence of guiding policies and protocols . The ICUs however, as part of their mode of operation are largely guideline and protocol-based and this may have contributed to the higher rates of thrombo-prophylaxis for at-risk hospitalized patients as reported in this study.

5.7 VTE Risk Profile and Prevalence of High VTE Risk among Adult Hospitalized Patients in KBTH

This study used a modification of the Caprini risk assessment model for the stratification of VTE risk of adult hospitalized patients in five (5) departments in KBTH. The modification was done by Ministry of Health-based expert team which reviewed the risk factors and their groupings to make the tool easier to use by medical

and nursing staff of varying grades and more practical for the Ghanaian and West African. It also condensed the very low and low categories into one category (low) as well as also condensed the high and highest categories into one category (high). The modified Caprini VTE risk assessment model used in this study, therefore, had only three (3) categories – low, moderate and high – while the significance and management implications of these risk levels remained unchanged from the original Caprini VTE risk assessment model.

The overall median (LQ, UQ) total VTE risk score of adult hospitalized patients in KBTH was found to be 4(3, 7). There is statistically significant departmental variation with patients hospitalized in the ICU and Accident, Trauma &Orthopaedic wards recording much higher median total risk factor scores of 7 and 6 ($p<0.001$) respectively. The overall prevalence of high VTE risk in this study of 47.2% is quite similar to the 57% prevalence of VTE risk found in the ENDORSE Senegal study (Ba et al, 2011), however, this study showed a statistically significant higher prevalence of high VTE risk in the ICU (76.7%) and Accident, Trauma &Orthopaedics (61.5%) ($p<0.001$). it is also notable from this study that when moderate and high risk profile levels are combined, eight (8) out every ten adult hospitalized patients is found to be at risk of VTE with its attendant high mortality risk in all departments except Obstetrics (62%).

This is note-worthy because the treatment recommendations for moderate and high VTE risks from the Caprini risk assessment model are basically the same with combination of pharmacological and physical thrombo-prophylaxis for both levels (Caprini, Tapson, Hyers et al, 2003). This implies that 80% of hospitalized adult patients (and all adult ICU patients, where no patient recorded low VTE risk level) in KBTH are expected to be on combinations of pharmacological (LMWH or unfractionated heparin) and physical (ICD or anti-embolic stockings) thrombo-

prophylaxis, unless precluded by either increased bleeding risk or contraindication to intermittent pneumatic compression.

Both this study and the ENDORSE Senegal study (Ba et al, 2011) give enough evidence that the prevalence or profile of VTE risk in the hospitalized adult patient in Sub-Saharan Africa is high and requires prompt preventive attention.

5.8 Relationship between VTE Risk Profile and Thrombo-prophylaxis Received

This study is in keeping with the ENDORSE Senegal study (Ba et al, 2011), in that both found inappropriately low level of thrombo-prophylaxis for the risk profile of these patients. Overall, less than a third of hospitalized patients receive thrombo-prophylaxis which is found to be indicated in about 80% of patients. Although statistically significant higher proportions of high VTE risk patients were found to be receiving both anti-embolic stockings (39.7%) and LMWH (46.8%) in comparison to low and moderate VTE risk patients; these rates of thrombo-prophylaxis are still too low at less than 50% adherence.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter draws conclusions on the study in direct answer to the specific objectives of the study and also makes recommendation based on this study to address any challenges regarding the knowledge and practices of health workers on VTE aimed at reducing and managing the risk of hospital-acquired VTE and associated mortality.

6.2 Conclusions

Knowledge on venous thromboembolism among clinical health workers (doctors and nurses) in KBTH is generally less than ideal with nurses significantly less knowledgeable. Even though the knowledge of the important mechanisms for the development of VTE is generally, acceptably good, the knowledge on the other practice-related issues such as the treatment modalities for the management of VTE and the awareness of the mortality implication of VTE in the hospitalized patient is well below par.

The aware of the clinical importance of thrombo-prophylaxis and self-reported VTE prevention practices among health workers in KBTH is generally good, except for the erroneous perception among about half of the health workers of VTE as being symptomatic in most hospitalized patients. However, the self-reported good prevention practices do not necessarily reflect actual thrombo-prophylaxis received by the patients.

There was no statistically significant association found between the VTE knowledge level of health workers and their self-reported thrombo-prophylactic practices

The prevalence of high-VTE risk among hospitalized adult patients in KBTH is high (47.2%) and is greatest at the ICU and Accident, Trauma and Orthopaedic patients.

6.3 Recommendations

Korle Bu Teaching Hospital (KBTH)

- To develop and adopt a comprehensive hospital-wide policy on VTE, and ensure implementation of its guidelines and protocols in all clinical departments in KBTH.
- That a sustainable program for regular and frequent re-training of health workers in KBTH on VTE, its risk assessment, prevention and management is set up.
- To adopt a VTE risk assessment model, to assist health workers in the detection and management of adult hospitalized patients at risk of VTE.

Ministry of Health and Ghana Health Service

- That the Ministry of Health and Ghana Health Service consider the development of similar policies to govern the assessment of VTE risk and management of both the risk and the disease as well as training of health workers.
- That similar study is conducted on the ambulatory and out-patient department (OPD) patients and other hospital settings (district and regional hospitals).

REFERENCES

Adomaityte, J., Farooq, M., & Qayyum, R. (2008). Effect of raloxifene therapy on venous thromboembolism in postmenopausal women. A meta-analysis. *Thrombosis and Haemostasis,99*, 338–342.

Aduful, H. K., & Darko, R. (2007). Deep venous thrombosis of the lower limb in young ambulant Ghanaians. *Ghana Medical Journal*, *41*(1), 17–20.

Autar, R. (2007). National Institute for Health and Clinical Excellence guidelines on reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients undergoing surgery. *Journal of Orthopaedic Nursing*, 11, 169-176.

Ba, S. A., Badiane, S. B., Diop, S. N., Diouf, F. S., Fal, l D., Ka, M. M., … Ndaiye, M. (2011). A cross-sectional evaluation of venous thromboembolism risk and use of venous thromboembolism prophylaxis in hospitalized patients in Senegal. *Archives of Cardiovascular Disease*, *104*, 493–501.

Bahl, V., Hu, H. M., Henke, P. K., Wakefield, T. W., Campbell, D. A. Jr, & Caprini, J. A. (2009). A validation study of a retrospective venous thromboembolism risk scoring method. *Annals of Surgery*, *251*(2), :344–350.

Bates, S., & Ginsberg, J. (2004). Clinical practice. Treatment of deep-vein thrombosis. *S C New England Journal of Medicine*, *351*(3), 268–77. https://doi.org/10.1007/s00244-004-0054-8

Bhatti, A. M., Ahsin, S., Salim, B., & Mansoor, J. (2012). Knowledge , attitude and practices of healthcare providers towards deep vein thrombosis prophylaxis in five teaching hospitals of Rawalpindi, *Journal of Ayub Medical College Abbottabab, 24*(2), 136–139.

Caprini J.A. (2010). Risk assessment as a guide for the prevention of the many faces of

venous thromboembolism. *American Journal of Surgery*, 199(1 Suppl): 3–10.

Caprini,J.(2005).Venous Thromboembolism Risk Factor Assessment.https://www.mdcalc.com/caprini-score-venous-thromboembolism-2005. Accessed on 25th July, 2018.

Caprini, J. A., Tapson, V. F., Hyers, T. M., Waldo, A. L., Wittkowsky, A. K., Friedman, R., … NABOR Steeing Committee. (2003). Treatment of venous thromboembolism : Adherence to guidelines and impact of physician knowledge , attitudes , and beliefs.*Journal of Vascular Surgery*, 42(4),726–733. https://doi.org/10.1016/j.jvs.2005.05.053

Caroline, R., Marval, P. (2011). Venous thromboembolism : risks and prevention. *Continuing Education in Anaesthesia, Critical Care & Pain*, 11(1), 18–23. https://doi.org/10.1093/bjaceaccp/mkq044

Chamberlain, A.M., Folsom, A.R., Heckbert, S.R., Rosamond, W.D., Cushman, M. (2008). High-density lipoprotein cholesterol and venous thromboembolism in the Longitudinal Investigation of Thromboembolism Etiology (LITE). *Blood.* 112:2675–2680.

Chew H.K, Wun T, Harvey D, Zhou H, White R.H. (2006). Incidence of venous thromboembolism and its effect on survival among patients with common cancers. *Archives of Internal Medicine*, 166:458–464.

Chopard P, Spirk D, & Bounameaux H. (2006). Identifying acutely ill medical patients requiring thromboprophylaxis. J*ournal of Thrombosis Haemostasis*, 4:915–916.

Clagett, G.P. & Reisch J.S. (1988). Prevention of venous thromboembolism in general surgical patients: results of a meta-analysis. *Annals of Surgery*, 208(2):227-240.

Cohen, A.T., Agnelli G., Anderson F.A., Arcelus J.I.,…VTE Impact Assessment Group in Europe (VITAE). (2007). Venous thromboembolism (VTE) in Europe. The number of VTE events and associated morbidity and mortality. *Thromb Haemost*, 98(4), 756-64.

Cohen, A.T., Tapson, V.F., Bergmann, J.F., Goldhaber, S.Z.,...Deslandes, B. (2008). Venous thromboembolism risk and prophylaxis in acute hospital care setting (ENDORSE study): a multinational cross sectional study. *Lancet*, 371, 387-94.

Collins, R., MacLellan, L., Gibbs, H.,& MacLellan, D. Fletcher, J. (2010). Venous thromboembolism prophylaxis: The role of the nurse in changing practice and savinglives, *Australian Journal of Advanced Nursing.* 27, (3), 83-9.

Doggen C.J. (2004). Serum lipid levels and the risk of venous thrombosis. *Arteriosclerosis, Thrombosis and Vascular Biology*. 24:1970–1975.

Elliot, C.G. (2000). The diagnostic approach to deep venous thrombosis. Seminars in *Respiratory and Critical Care Medicine*, 21(6):511-519.

Farquhar, C. Kofa, E. & Slutsky, J. (2002). Clinicians' attitudes to clinical practice guidelines: a systematic review, *The Medical Journal of Australia*, 177(9), 502-506.

Folsom,A.R., & Chamberlain, A. (2008). Lipoprotein(a) and venous thromboembolism. *American Journal of Medicine,121(2): e17–e19.*

Geerts, W., Bergqvist, D., Pineo, G., Heit, J., Samama, C., Lassen, M. & Colwell, C. (2008). Prevention of Venous Thromboembolism: American College of Chest Physicians Evidence Based Practice Guidelines (8th Edition). *Chest*, 133(6):381-453

Geerts W. (2008). Antithrombotic and Thrombolytic Therapy. Chest. 133(8th Ed: ACCPGuidelines):381s–451s.

Geerts, W.H., Pineo G.F., Heit J.A., Bergqvist D., Lassen M., (2004). Prevention of venousthromboembolism: The Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 126: 338-400

Geerts, W.H., Code, K.I., Jay, R.M., Chen, E., and Szalai, J.P. (1994). A prospective study of venous thromboembolism after major trauma. *The New England Journal of Medicine*, 331(24):1601-1606.

Harvey, R.L., Lovell, L.L., Belanger, N., and Roth, E.J. (2004). The effectiveness of anticoagulant and antiplatelet agents in preventing venous thromboembolism during stroke rehabilitation: A historical cohort study. *Archives of Physical Medicine and Rehabilitation*, 85:1070-1075.

Hatef D.A, Kenkel J.M, Nguyen M.Q, Farkas J.P, Abtahi F, Rohrich R.J, Brown S.A. (2008). Thromboembolic risk assessment and the efficacy of enoxaparin prophylaxis in excisional body contouring surgery. *Plastic & Reconstructive Surgery*, 122(1):269–279.

Heit, J. A. (2015). Epidemiology of venous thromboembolism. *Nature Review Cardiology*,*12*(8),464–474. https://doi.org/10.1038/nrcardio.2015.83.Epid.

Heit JA. (2005). Trends in the incidence of venous thromboembolism during pregnancy or postpartum: a 30-year population-based study. *Annals of Internal Medicine*, 143:697–706.

Jorgensen, L.M., Will-Jorgensen, P. and Hauch, O. (1993). Prophylaxis of postoperative thromboembolism with low molecular weight heparins. *British Journal of Surgery*,80:689-704.

Kesieme, E. B., Arekhandia, B. J., Inuwa, I. M., Akpayak, I. C., Ekpe, E. E., Olawoye, O. A., … Awunor, N. S. (2016). Knowledge and practice of prophylaxis of deep venous thrombosis : A survey among Nigerian surgeons. *Nigerian Journal of*

Clinical Practice, 19(2):170–174.

Khalafallah, A.A., Kirkby, B.E.,…..Terry, H. (2016). Venous thromboembolism in medical patients during hospitalisation and 3 months after hospitalisation: a prospective observational study. *BMJ Open*, 6(8), e012346.

Khan F, Vaillancourt C & Bourjeily G (2017). Diagnosis and management of deep vein thrombosis in pregnancy. *British Medical Journal*, 357:j2344.

Korubo, K., Omunakwe, H., & Ekeke, O. N. (2015). Awareness of venous thromboembolism among doctors in a Nigerian Tertiary. *East african Medical Journal*, 92 (12):367-372.

Kröger, K., Küpper-nybelen, J., Moerchel, C., Moysidis, T., Kienitz, C., & Schubert, I. (2012). Prevalence and economic burden of pulmonary embolism in Germany. *Vascular Medicine*, 17 (5): 303-309.https://doi.org/10.1177/1358863X12449363

Kumar, D.R., Hanlin, E.,….. Yale, S.H. (2010). Virchows contribution to the understanding of thrombosis and cellular biology. *Clin Med RES*, 8(3-4), 168-172.

Krishnaswamy, A., Lincoff, A.M., Cannon, C.P. (2010). The use and limitations of unfractionated heparin. *Crit Pathw Cardiol*, 9(1), 35-40.

Lee, J.A., Grochow, D., Drake, D…van Servellen, G. Evaluation of hospital nurses' perceived knowledge and practice of venous thromboembolism assessment and prevention. *J Vasc Nurs*, 32(1), 18-24. doi: 10.1016/j.jvn.2013.06.001.

Lee, S.Y., Ro, D.H.,...Park, M.S. (2015). Incidence of deep vein thrombosis after major lower limb orthopedic surgery: analysis a nationwide claim registry. *Yonsei Med J.*, 56(1), 139-145.

MacLellan, D.G. & Fletcher, J., (2007). Mechanical Compression in the Prophylaxis of Venous Thromboembolism. *ANZ Journal of Surgery*, 77(6):418-423.

Makusidi, M.A., Isah, M.D., Akintomide, F., Abdullahi, M., Yakubu, A. (2016). Knowledge, attitude and practice of venous thromboembolism prophylaxis among medical practitioners in a teaching hospital setting. *Orient Journal of Medicine*, 28(1-2), 36-43.

Mbewu, A., & Mbanya, J.C. (2006). Cardiovascular disease in disease and mortality in Sub-Saharan Africa. *CVD in Africa*, Jamison, DT, et al , editors, 2nd Edition. Washinton (DC): World Bank.

McRae, S. (2014). Treatment options for venous thromboembolism: lessons learnt from clinical trials. *Thrombosis Journal*, 12, 27.

Mismetti, P., Laporte, S., Zufferey, P., Epinat, M., Decousus, H. & Cucherat, M. (2004). Prevention of venous thromboembolism in orthopaedic surgery with vitamin K antagonist: a meta-analysis. *Journal of Thrombosis and Haemostasis*, 2(7):1058-1070.

National Health and Medical Research Council (NHMRC) (2009). Clinical Practice Guideline for the prevention or venous Thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to Australian Hospitals, NHMRC, Melbourne.https://www.nhmrc.gov.au/guidelines-publications/cp115.Accessed on 29th July, 2018.

National Intstute for Clinical Excellence (NICE). House of Common Health Committee- The Prevention of Venous Thromboembolism in Hospitalised Patients,Second Report of Session 2004-05.https://publications.parliament.uk/pa/cm200405/cmselect/cmhealth/99/99.pdf. Accessed on 20th June, 2018.

Roach R.E. (2013). The risk of venous thrombosis in individuals with a history of superficial vein thrombosis and acquired venous thrombotic risk factors. *Blood*. 122:4264–4269.

Sajid, M., Tai, N., Goli, G., Morris, R., Baker, D. and Hamilton, G. (2006). Knee versus Thigh Length Graduated Compression Stockings for the Prevention of Deep Venous Thrombosis: A Systematic Review. *European Journal of Vascular Endovascular Surgery*, 32(6):730-736.

Samama MM (2000). An epidemiologic study of risk factors for deep vein thrombosis in medical outpatients: the Sirius study. *Archives of Internal Medicine,* 160:3415–3420.

Sherman, D.G., Albers, G.W., Bladin, C., Fieschi, C., Gabbai, A.A., (2007). The efficacy and safety of enoxaparin versus unfractionated heparin for the prevention of venous thromboembolism after acute ischaemic stroke (PREVAIL Study): an open-label randomized comparison. *The Lancet*. 369:1347-1355.

Sørensen HT, Horvath-Puho E, Pedersen L, Baron JA, Prandoni P. (2007). Venous thromboembolism and subsequent hospitalisation due to acute arterial cardiovascular events: a 20-year cohort study. *Lancet*; 370:1773–1779.

Snyman, L.C., & Potgieter, J. (2014). Venous thromboembolism: risk profile and management of prophylaxis in gynaecological surgery patients. *S Afr J OG*, 20(3), 76-79. DOI:10.7196/SAJOG.490.

Tang, X., Sun, B., Yang, Y., & Tong, Z. (2015). A Survey of the Knowledge of Venous Thromboembolism Prophylaxis among the Medical Staff of Intensive Care Units in North China. *PLoS One*, 10(9): e0139162. https://doi.org/10.1371/journal.pone.0139162

van Hylckama V.A, Helmerhorst FM, Rosendaal FR. (2010). The risk of deep venous thrombosis associated with injectable depot-medroxyprogesterone acetate contraceptives or a levonorgestrel intrauterine device. *Arteriosclerosis, Thrombosis & Vascular Biology*, 30:2297–2300.

Vossen CY, & Rosendaal FR (2005). The protective effect of the factor XIII Val34Leu mutation on the risk of deep venous thrombosis is dependent on the fibrinogen level. *Journal of Thrombosis Haemostasis.* 3:1102–1103.

Zakai NA, Wright J, & Cushman M. (2004). Risk factors for venous thrombosis in medical inpatients: validation of a thrombosis risk score. *Journal of Thrombosis Haemostasis*, 2:2156–2161.

Zöller B, Li X, Sundquist J, Sundquist K. (2012). Shared familial aggregation of susceptibility to different manifestations of venous thromboembolism: a nationwide family study in Sweden. *British Journal of Haematology*, 157:146–148.

APPENDICES

Appendix A: Informed Consent form

Principal Investigator: Christian Owoo, School of Public Health, University of Ghana, Legon. Tel: 0244668871, email:chris_owoo@yahoo.com; okeyowoo@gmail.com

Introduction

This study seeks to assess the knowledge, practices and prevention of venous thromboembolism in Korle Bu Teaching Hospital, Accra.

Procedures

This will involve obtaining the folders or clinical notes of all adult patients on admission in selected departments/ units at the Korle Bu Teaching Hospital, Accra. Adult patients who had been on admission the selected departments for at least one day and permanent health workers who have been with the hospital for at least one year will be selected. A period of four weeks [one month] will be used to interview the respondents via questionnaires and risk assessment tool. This study is purely an academic work which forms part of my requirement for the award of a Master of Public Health degree.

Risks and Discomforts

There will not be any potential risks to respondents who will form part of the study. No risk or discomfort is foreseen concerning your participation in this research apart from your time that will be spent in participating in answering the questionnaire. Sensitive information to be included in the study will be presented as a group data so that individual records will not be alluded to. Each questionnaire and risk assessment tool will take 15-20 minutes on the average to complete.

Benefits and Reimbursement

There will be no direct benefit to respondents whose information will be used, but the findings will likely help find out more about knowledge, practices and prevention of venous thromboembolism. Participants will not be provided any incentive to respond to the survey required for this research. It is hoped that results gathered will be shared with policy makers, academia, and other stakeholders to prioritize venous thromboembolism diagnosis and management among patients on admission.

Confidentiality and Anonymity

To protect the identity of participants, the questionnaires will not include patients' name, rather this will be substituted with assigned identification numbers. Information from the questionnaire will not be shared with other individuals outside the research team. In publishing, data will be reported as group data so that individual records will not be alluded to.

Participant consent form

I have been thoroughly briefed on the entire methodology and significance of the ongoing study which is being conducted by Dr. Christian Owoo. On my own free will, I hereby consent to be part of the study, based on my understanding of what the study entails.

I am doing this on condition that under no circumstance should any references be made to my actual identity to any other person(s) after providing all the information requested from me for this particular study as promised by the researcher.

Respondent signature…….. Date ……

Witness' signature …….. Date ……

Researcher signature ……. Date ……..

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact the principal investigator Dr. Christian Owoo (0244668871).This proposal will be reviewed and approved by the Korle Bu Teaching Hospital Institutional Review Board, which is a committee whose task is to make sure that research participants are protected from harm. If you wish to find about more about the KBTH IRB, contact Mr. Nortey (0277743365).

Appendix B: Questions on the assessment of the knowledge, perception and practices of health workers on VTE

SECTION A: SOCIO-DEMOGRAPHIC PROFILE OF PARTICIPANT HEALTH WORKER

1. Participant health worker's number ……
2. Age of participant health worker……..
3. Sex of participant health worker
   A. Male
   B. Female
4. Profession of participant health worker
   A. Doctor
   B. Nurse
5. Department/ specialty of participant
   A. Internal medicine
   B. Surgery
   C. Obstetrics and Gynaecology
   D. Accident centre
   E. Anaesthesia ICU
   F. Cardiothoracic ICU
   G. Medical ICU
6. Rank of participant ……
7. Years of clinical practice of participant
   A. 1 – 3 years
   B. 4 – 5 years
   C. 6 – 10 years
   D. 11 – 20 years
   E. More than 20 years

SECTION B: KNOWLEDGE OF PARTICIPANTS ON DVT/ VTE

8. Which of the following groups of patient population has the most probability of risk for DVT/ venous thromboembolism (VTE)?
   A. Males
   B. Females
   C. Persons less than 30 years old
   D. Persons more than 40 years old
   E. Don't know
9. Which is the most important mechanism of DVT/ VTE risk?
   A. Hypercoagulability
   B. Stasis
   C. Vascular injury
   D. All of the above
   E. Don't know

10. Which one of these is not a risk factor for DVT/ VTE?
    A. Cardiac failure
    B. Peripartum state
    C. Oral contraceptive pill use
    D. Surgery duration of less than 30 minutes
    E. Don't know
11. Which one of these has the most incidence of deep vein thrombosis (DVT) during surgery?
    A. Obese patient
    B. Surgery for malignancy
    C. Old age
    D. Pelvic surgery
    E. Don't know
12. Which of the following statements is correct about VTE?
    A. DVT of the thigh has 40% chance of PE
    B. Calf DVT has 50% probability of PE
    C. Proximal site of DVT decrease the risk of PE
    D. DVT is the most common source of PE
    E. Don't know
13. Which one of the following statements reflects the outcome of DVT without treatment?
    A. Proximal extension
    B. Limited by fibrinolysis or organization in calf DVT
    C. Embolization risk is increased
    D. All of the above
    E. Don't know
14. Which of the following should determine the selection of VTE preventive measures during surgery?
    A. Number of risk factors
    B. Type of surgery
    C. Type of anaesthetic drug
    D. A and B
    E. Don't know
15. Which of the following measures is not applicable for DVT prophylaxis during surgery?
    A. Intermittent pneumatic compression
    B. Low dose heparin
    C. Warfarin with INR of 2.5 – 3.0
    D. Elastic (TED) stockings
    E. Don't know
16. Which of the following statements about Pulmonary Embolism (PE) is not correct?
    A. It's the most common cause of preventable mortality in hospital
    B. DVT is the most common cause
    C. It's the most common cause of cyanosis in surgery
    D. Most of them have normal chest x-ray
    E. Don't know

17. Diagnosis and commencement of treatment for PE is based on?
    A. Clinical criteria
    B. Simple haematologic tests
    C. Sophisticated imaging
    D. Clinical suspicion is enough
    E. Don't know
18. The following are standard modalities for the treatment of VTE?
    A. Heparin only
    B. Heparin + warfarin
    C. Inferior vena cava filters
    D. Embolectomy
    E. Don't know
19. If a patient is on prophylactic dose of unfractionated heparin, when do we need to stop it before surgery or invasive procedure?
    A. Stop 2 days prior
    B. Stop 1 day prior
    C. Stop 12 hours prior
    D. Stop 6 hours prior
    E. Do not stop
    F. Any other, specify
    G. Don't know
20. If a patient is on prophylactic dose of low molecular weight heparin (LMWH), when do we need to stop it before surgery or invasive procedure?
    A. Stop 2 days prior
    B. Stop 1 day prior
    C. Stop 12 hours prior
    D. Stop 6 hours prior
    E. Do not stop
    F. Any other, specify
    G. Don't know
21. What percentage of hospitalized deaths could be attributed to VTE?
    A. 1%
    B. 2%
    C. 5%
    D. 10%
    E. 20%
    F. Don't know

SECTION C: PERCEPTION AND PRACTICE OF HEALTH WORKER PARTICIPANTS

22. Do you think VTE prophylaxis is clinically important?
    A. Yes
    B. No
    C. No response

23. In your opinion and practice, are most of the patients who develop DVT/ VTE, symptomatic?
    A. Yes
    B. No
    C. Don't know
24. Have you ever prescribed VTE prophylaxis yourself?
    A. Yes
    B. No
    C. No response
25. If yes to Question 17 above, how frequently do you prescribe?
    A. Routinely
    B. Most of the time
    C. Occasionally
    D. Rarely
    E. Never
    F. No response
26. If yes to Question 17 above, what prophylaxis modalities have you prescribed?
    A. Unfractionated heparin
    B. Low molecular weight heparin (LMWH)
    C. Anti-embolic stockings (e.g. TEDS)
    D. Intermittent compressive devices
    E. All of the above
    F. No response
27. Which of the following VTE prophylaxis modalities are available in your department/ unit?
    A. Unfractionated heparin
    B. Low molecular weight heparin (LMWH)
    C. Anti-embolic stockings (e.g. TEDS)
    D. Intermittent compressive devices
    E. All of the above
    F. None of the above
    G. No response
28. If you do not prescribe VTE prophylaxis routinely, why?
    A. Not a prescriber
    B. Do not feel it is important
    C. Risk of bleeding outweighs the benefits
    D. Cost of prophylaxis
    E. Not relevant to our setup
    F. Told not to prescribe by senior colleagues
    G. Others, specify
    H. No response
29. Do your department/ unit have a policy regarding VTE prophylaxis?
    A. Yes
    B. No
    C. Don't know

Appendix C: Questions on the medical information and VTE management of adult hospitalized patients

SECTION A: SOCIODEMOGRAPHIC PROFILE OF PARTICIPANT HOSPITALIZED PATIENT

1. Participant patient ID number …….
2. Age of patient ……..
3. Sex of patient
   A. Male
   B. Female
4. Level of education of patient
   A. Uneducated
   B. Less than senior high school
   C. Senior high school/ O-level/ A-level
   D. Tertiary
   E. Post-tertiary
5. Occupation of patient……
6. Religion of patient
   A. Christianity
   B. Islam
   C. Traditional
   D. Others, specify
   E. No response
7. Department/ specialty currently admitted to…….
8. Reason or diagnosis for current admission……
9. Duration of current admission …….

SECTION B: MEDICAL MANAGEMENT INFORMATION OF PATIENT PARTICIPANT

10. Personal history of DVT/ VTE
    A. Yes
    B. No
    C. Don't know
11. Family history of DVT/ VTE
    A. Yes
    B. No
    C. Don't know
12. Currently receiving thrombo-prophylaxis
    A. None
    B. Anti-embolic stockings
    C. Intermittent compressive devices
    D. Unfractionated heparin
    E. Low molecular weight heparin (LMWH)
    F. Don't know

13. History of ever receiving thrombo-prophylaxis
    A. None
    B. Anti-embolic stockings
    C. Intermittent compressive devices
    D. Unfractionated heparin
    E. Low molecular weight heparin (LMWH)
    F. Don't know
14. Any history of bleeding complication from thrombo-prophylaxis?
    A. Yes
    B. No
    C. Don't know
15. If not currently receiving thrombo-prophylaxis, what is the reason?
    A. Not prescribed by doctors
    B. Told he cannot take it because of risk
    C. Refused to receive it
    D. Can't afford because of cost
    E. Others, specify
    F. Don't know

Appendix D: Modified Caprini VTE Risk Assessment Model

DVT/ VTE RISK FACTOR ASSESSMENT FORM

Patient Name: ……..... Age: …….....yrs

Sex: M[ ] F[ ]Wt: …… kg Ht: …….. m BMI: …… kg/m^2

Department …… Ward: ……Specialty: ……....

Diagnosis: .....

Choose all that Apply

Each risk factor represents 1 point **SUB-SCORE=**

[] Age > 40 years [ ] Minor scheduled surgery [ ] History of previous major surgery <1 month
[ ] Varicose veins [ ] BMI > 25 [] Current swollen legs [ ] Serious lung disease in < 1 month [ ] Acute myocardial infarction [] Congestive heart failure in <1 month [] Sepsis < 1 month [ ] Serious lung disease incl. pneumonia < 1 month [ ] Diabetes mellitus [ ] Dyslipidaemia [ ] Abnormal pulmonary function (e.g. COPD) [ ] Medical patient currently at bed rest [ ] Leg plaster cast/brace [ ] In-situ Central Venous Catheter [] Blood transfusion < 1 month.

For women only (each represents 1 point) **SUB-SCORE=**

[] Oral contraceptives or hormone replacement therapy [ ] Pregnancy or postpartum < 1 month

[] History of unexplained stillbirth/ recurrent spontaneous abortion ≥ 3/ premature birth with pre-eclampsia.

Each risk factor represents 2 points **SUB-SCORE=**

[ ] Age > 60 years [ ] Major surgery for 1-3 hours [ ] Arthroscopic/ Laparoscopic Surgery > 60 minutes
[ ] Laparoscopic surgery > 60 minutes [ ] Previous malignancy [ ] BMI > 40
[ ] History of SVT, DVT/PE [ ] Family history of DVT/PE [ ] Present cancer /chemotherapy
[ ] Known Acquired Thrombophilia [ ] Known Inherited thrombophilia

Each risk factor represents 5 points **SUB-SCORE=**

[ ] Elective major lower extremity arthroplasty [ ] Hips/ pelvis/ leg fracture < 1 month [ ] Stroke < 1 month
[ ] Multiple trauma < 1 month [ ] Acute spinal cord injury (paralysis) < 1 month [ ] Major surgery > 3 hours

Total Risk Factor Score	

0-2	3-4	5 or more
Low	Moderate	High

FACTORS ASSOCIATED WITH INCREASED BLEEDING RISK OR PRECLUDING IPC

Anticoagulants: Factors associated with increased bleeding

[ ] Is patient experiencing any active bleeding?

[ ] Does patient have (or has had history of) heparin-induced thrombocytopenia?

[ ] Is patient's platelet count **<20,000mm?**

[ ] Is patient taking oral anticoagulants, platelet inhibitors (e.g. NSAIDS, Clopidogrel, Salicylates)?

[ ] Is the patient using any herbal medications?

[ ] Is patient's Creatinine Clearance abnormal? If yes, please indicate value of serum creatinine……..

If any of the above boxes are checked, then the patient may not be a candidate for anticoagulant therapy

Factors Precluding Use of Intermittent Pneumatic compression (IPC)

[ ] Does patient have severe peripheral arterial disease?

[ ] Does patient have congestive heart failure?

[ ] Does patient have acute superficial/deep vein thrombosis?

If any of the above boxes are checked, then the patient may not be a candidate for intermittent compression therapy and you should consider alternative prophylactic measures (e.g. IVC filter)

Name of Assessor…….. Date…… Time ……..

Signature of Assessor……

Name of Supervising Physician …….. Date…… Time ……

Signature of Physician ……

Appendix E: Budget

Item	Unit Cost	Frequency	Total (GHC)
Proposal development			
Internet Data (Surfline)	GHC 50	4	200
Ethical Review Committee (KBTH IRB)	GHC 450	1	450
Training of research assistants			
Research Assistants	GHC 100	2	200
Transportation	GHC 50	3	150
Field Work			
Transport for field work	GHC100	5	500
Stationary	GHC 200	1	200
Meals	GHC 40	3(2)	240
Finishing Final work			
Stationary /Print out /Hard Cover	GHC100	7	700
Miscellaneous	GHC 200	1	200
TOTAL			**GHC 2840**

Appendix F: Timelines

	2017				2018						
ACTIVITY	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Proposal Development											
Proposal submission to E.R.C											
Training research assistants											
Pilot study											
Collection of data											
Data Editing and Proof Reading											
Data Entry											
Data Analysis											
Results and discussion											
Finalize Dissertation											
Submitting dissertation											