An Evaluation of Critical Care Nurses' Perceived Knowledge and Practices of Venous Thromboembolism

A dissertation presented to the Faculty of Health Sciences in part-fulfilment of the requirements for the Degree of Master of Science in Nursing (Critical Care) at the University of Malta

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ABSTRACT

Background: Venous thromboembolism (VTE), including deep vein thrombosis and pulmonary embolism, is a significant contributor to hospital in-patients' morbidity and mortality, particularly in critical care settings. Patients in these environments face increased risks due to immobility, surgical procedures, and multiple comorbidities. Nurses are integral to the prevention, assessment, and management of VTE, yet gaps in their knowledge and actual practices may compromise patient outcomes. This study evaluates the knowledge and practices of critical care nurses in Malta concerning VTE care.

Methodology: A cross-sectional, quantitative research design was employed. Data was collected from critical care nurses (n=98) via a structured, validated questionnaire adapted from an existing validated tool, aligned with updated VTE guidelines. Descriptive and inferential statistics were used to assess demographic variables, self-rated and actual knowledge, VTE-related practices, self-efficacy, and perceived barriers to VTE risk assessment.

Findings: The study revealed moderate knowledge and practice scores among participants. Nurses demonstrated stronger knowledge of common VTE risk factors but struggled to identify less familiar or complex ones. Confidence was highest in patient education and lowest in technical interventions such as mechanical prophylaxis application. Training attendance was low, though positively rated by those who had received it. No significant correlations were observed between demographic variables and knowledge or practice scores. Barriers such as workload, limited training, and unclear protocols were more strongly associated with practice variability.

Conclusion: The research highlights that while knowledge of VTE was moderate among participants, it did not necessarily translate into consistent VTE care practices. Effective practice requires institutional support, structured and context-specific training, and the integration of clear, accessible protocols. Addressing systemic and environmental barriers is essential to improving patient safety and nursing performance in critical care settings.

Keywords: Venous thromboembolism, VTE, critical care nursing, nursing knowledge, nursing practice, nursing education, quantitative research.

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Abbreviations and Acronyms

ACCP – American College of Chest Physicians

CASP – Critical Appraisal Skills Programme

CCCU – Cardiac Critical Care Unit

CICU – Cardiac Intensive Care Unit

CINAHL – Cumulative Index to Nursing and Allied Health Literature

CPD - Continuous Professional Development

CT – Computed Tomography

DOACs – Direct Oral Anticoagulants

DVT – Deep vein thrombosis

EBP – Evidence-Based Practice

EU – European Union

FREC – Faculty Research Ethics Committee

H_0 - Null Hypothesis

H_1 - Alternative Hypothesis

HDUs – High-dependency units

HyDi – Hybrid Discovery

ICU – Intensive Care Unit

IRBs – Institutional review boards

ITU – Intensive Therapy Unit

MDH – Mater Dei Hospital

OAR – Open Access Repository

PE – Pulmonary Embolism

PEO – Population Exposure Outcome

PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SHDU – Surgical High Dependency Unit

SPSS - Statistical Package for Social Science

UM - University of Malta

US – United States

VTE – Venous thromboembolism

Chapter 1

Introduction

1.1 Introduction

This chapter serves as an introduction to the study, providing insights into the context, significance, and scope of evaluating nurses' knowledge and practices of venous thromboembolism (VTE) care in critical care settings. It begins by providing background information on VTE, highlighting its impact on patient health, its prevalence in critical care settings, and the crucial role of nursing in preventing and managing this condition. The chapter then outlines the study's main aim, objectives and research question, emphasising the importance of understanding gaps in knowledge and practices to improve nursing and patient care. Finally, it highlights the research's significance, discusses the methodology overview, and concludes with a summary of the study's intended contributions to the field of critical care nursing.

1.2 Background information and rationale

VTE, which comprises deep vein thrombosis (DVT) and pulmonary embolism (PE), poses a significant risk to patient health, contributing to a reduced quality of life, increased morbidity and mortality, and often resulting in increased admission rates in critical care settings. (Caprini, 2011). DVT occurs when a thrombus forms in the deep veins, most commonly in the lower limbs. This can cause erythema, swelling, pain and discomfort, and in some cases, the thrombus can dislodge and travel through the bloodstream. When the thrombus migrates to the lungs, it can result in a PE, a life-threatening condition that obstructs pulmonary blood flow. Symptoms can be more severe and may include sudden shortness of breath, chest pain, tachycardia and coughing, which may sometimes involve haemoptysis (Lutsey & Zakai, 2023).

VTE affects a substantial portion of the population globally, with annual incidence rates estimated between 75 and 269 cases per 100,000 individuals in regions such as Western Europe, North America, Australia, and southern Latin America. Among individuals aged 70 and older, the incidence can be as high as 700 per 100,000 (Konstantinides et al., 2016). Moreover, thromboembolic conditions significantly contribute to the global disease burden and stands as a leading cause of mortality, accounting for approximately one in four deaths worldwide (Wendelboe et al., 2015). The risk of VTE nearly doubles with each decade after the age of 40 years, suggesting that the prevalence of VTE will likely increase as the global population ages (Konstantinides et al., 2016). This growing incidence highlights the urgent

need for vigilant nursing care and effective VTE prevention and management strategies, particularly in critical healthcare settings.

In critical care healthcare settings, patients face heightened risks of VTE due to factors such as immobility, surgical interventions, and serious medical conditions, which necessitate continuous monitoring and timely interventions to prevent complications and deterioration (Brækkan & Hansen, 2023). The prevalence of DVT and PE in ICU (Intensive Care Unit) patients varies widely and is often asymptomatic. Studies report DVT incidences ranging from 10% to 100% in ICU patients with no clinical suspicion and asymptomatic PE in 24% of trauma patients. Despite thromboprophylaxis, PE is detected in 1.3% to 3.2% of ICU patients. Concurrent DVT was present in 33% of PE cases. PE is frequently underdiagnosed, with autopsies detecting it in 7–27% of critically ill patients, of which only one-third were clinically suspected (Minet et al., 2015). In terms of local statistics, Table 1.1 presents the number of discharges from Mater Dei Hospital (MDH) with a recorded discharge diagnosis of PE and/or DVT from the beginning of 2022 to July 2024.

Table 1.1

Discharges from MDH with a recorded Discharge Diagnosis of PE and/or DVT
(Hospital Activity Analysis, MDH, 2024)

Age group in years	2022 total	2023 total	Jan-Jul 2024 total
15-24	4	6	3
25-34	28	22	11
35-44	39	45	29
45-54	43	37	24
55-64	67	64	46
65-74	133	144	84
75-84	127	171	82
85-94	59	66	37
95+	6	8	2
Total	**506**	**563**	**318**

There was an observed rise in older adults diagnosed with PE and/or DVT in 2023 compared to 2022, indicating a gradual increase in the prevalence or diagnosis of VTE. Of the total PE and DVT cases, 6.9% were admitted to critical care units in Malta in 2022. These units include the Intensive Therapy Unit (ITU), Surgical High Dependency Unit (SHDU), Cardiac Critical Care Unit (CCCU), and Cardiac Intensive Care Unit (CICU). In 2023, 7.3% of cases were admitted, while from January to July 2024, 5.3% of cases required admission to critical care units (Hospital Activity Analysis, MDH, 2024). Nurses working in these units, with their direct and frequent patient contact, play a crucial role in VTE assessment and prevention. This role requires a comprehensive understanding of VTE risk factors, prophylactic strategies, and therapeutic interventions.

Despite the availability of evidence-based guidelines for VTE prevention and management, research suggests that there may be variability in nurses' knowledge and adherence to these practices, potentially impacting patient outcomes mainly related to VTE incidence, patient safety, and recovery times (Al-Mugheed & Bayraktar, 2023). The selection

of this study topic reflects an ongoing need to evaluate the knowledge and practices of nurses working in critical care settings regarding VTE care, as well as to identify potential gaps in their understanding that may hinder optimal patient management. Investigating this knowledge is critical, as well-informed nurses play a significant role in applying VTE prevention protocols, conducting thorough risk assessments, implementing timely interventions, such as anticoagulant therapy and mechanical measures, and educating patients on measures to reduce VTE risks (Heit et al., 2016).

1.3   Research Aim, Objectives and Question

Given the significant role of nurses in critical care settings in providing continuous monitoring and care for critically ill patients, coupled with the rising prevalence of VTE in hospitalised patients, this research aims to assess nurses' knowledge and practices regarding VTE care. This includes understanding VTE assessment and prevention protocols. While knowledge refers to what nurses understand about VTE, practices pertain to the actual actions nurses take in clinical settings, such as implementing VTE prevention strategies, monitoring and assessing at-risk patients, making clinical decisions in VTE management, and educating patients and families about VTE. It is imperative to note that possessing more knowledge does not necessarily guarantee the ability to apply it effectively, particularly due to factors such as time constraints. Therefore, this study aims to evaluate both the perceived knowledge and the practices of nurses in critical care settings.

To address this aim, the study is guided by the following objectives:
1. To evaluate the overall knowledge levels and current practices of nurses working in critical care settings, regarding VTE risk factors, prevention, and management.
2. To determine whether demographic factors, such as age, years of experience, and prior training or courses related to VTE care, are associated with scores of knowledge and practices.
3. To identify gaps in knowledge or practices related to VTE care, using these insights to suggest targeted educational and training interventions.
4. To explore barriers that may influence nurses' understanding and implementation of VTE care, with the ultimate goal of enhancing patient outcomes through improved nursing and clinical education in these high-risk environments.

Based on these objectives, the final research question adopted in this research study was the following:

What are the perceived knowledge and practices of nurses working in critical care settings regarding the nursing care of patients with venous thromboembolism?

1.4 Significance of Research

This study is highly relevant to the fields of critical care nursing and nursing education, as it addresses a vital aspect of patient safety in critical care settings, which encompass not only ITU but also high-dependency units (HDUs), CCCUs and CICUs. This research will take all these areas into account. Since patients in these settings face an elevated risk of developing VTE, effective assessment and prevention are crucial to reducing its incidence and associated complications. By implementing evidence-based protocols, nurses can help prevent adverse events, reduce hospital length of stay, and improve overall patient recovery and safety.

The findings of this study are expected to contribute to the scientific body of knowledge by providing insights into current knowledge levels and practices among nurses working in critical care settings regarding VTE care. Additionally, the study aims to identify local research gaps in these settings and address the limited international literature which focuses on this specific area. These insights can inform nurse educators, healthcare policymakers, and hospital administrators in designing targeted educational and training interventions that enhance nurses' knowledge and skills, ultimately with the hope of promoting better patient outcomes. By identifying specific areas where knowledge gaps exist, this study also has practical implications for nursing practice, as it supports the development of tailored training programs aimed at improving compliance with VTE prevention protocols. Moreover, by addressing these gaps, this study aligns with broader healthcare goals of reducing hospital-acquired conditions and promoting a culture of safety in high-risk care environments.

1.5 Overview of the Research Design

In this quantitative cross-sectional research study, which is a type of research design that collects and analyses data at a single point in time, to examine the relationships between variables (Kesmodel, 2018), data was collected using a structured questionnaire. A questionnaire was selected following a literature review, based on a validated tool utilised by Lee et al. (2014) in their study conducted in the United States (US). The questionnaire, designed to assess levels of knowledge and practices related to the nursing care of VTE, was

minimally updated to reflect the most recent American College of Chest Physicians (ACCP) VTE prevention and treatment guidelines and local terminology, and was thereafter distributed to nurses working in critical care settings in MDH. Quantitative data analysis involved descriptive statistics to summarise knowledge levels and practices, as well as inferential statistics to explore relationships between these factors and demographic or professional variables, such as years of experience and prior VTE-related training. Eligible participants were registered nurses currently employed in critical care settings in Malta, with at least six months of experience in these units prior to data collection in November 2024. Ethical approval for this research study was granted by the University of Malta's (UM) Faculty Research Ethics Committee (FREC).

1.6 Conclusion

This introductory chapter has outlined the rationale, aim, significance, and research design of this research study, which highlights the imperative role that nurses play in ensuring optimal nursing care and patient safety in critical care settings in regards to VTE, and underscores the importance of assessing their level of knowledge and practices in this area. By identifying potential knowledge gaps and inconsistencies in practice, this research aims to provide valuable insights into critical care nursing, emphasising areas for improvement in VTE-related care. The next chapter provides a comprehensive review of the existing literature relevant to VTE assessment prevention, nursing care, and knowledge.

Chapter 2

Literature Review

2.1 Introduction

This chapter provides a review of the literature related to the key focus of the research study: the level of knowledge and practices among nurses working in critical care settings regarding the nursing care of VTE. The review examines existing studies on VTE management, the challenges nurses face in recognising and managing VTE in critically ill patients, and the impact of their knowledge and practices on patient outcomes. It also highlights the educational needs and specific barriers nurses encounter in these settings, identifying gaps in current understanding and practice that this research aims to address.

2.2 PEO Question

The following PEO (Population, Exposure, Outcome) question was developed to guide the literature review:

What are the perceived knowledge and practices of nurses working in critical care settings regarding the nursing care of patients with venous thromboembolism?

Table 2.1 below presents the individual PEO elements along with their specific definitions.

Table 2.1

PEO elements and their specific definitions

PEO elements	Specific definitions
Population	**Nurses working in critical care settings** This term refers to nurses working in critical care settings, including high-dependency units, where they care for patients who require continuous monitoring and complex medical or surgical interventions.
Exposure	**Nursing care of patients with VTE** This term refers to the specific nursing interventions and practices related to the prevention, detection, and management of patients with VTE.
Outcome	**Nurses' perceived knowledge and practices related to VTE care** This term refers to the perceived barriers and challenges, as well as the level of knowledge and clinical practices of critical care nurses, in preventing, detecting and managing VTE.

2.2.1   Keywords, Synonyms, and Search Tools

This section outlines the approach taken in the literature search carried out between September and October 2024. It also explains how the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and several appraisal tools supported the researcher in evaluating the selected literature. Firstly, the process began with identifying relevant keywords and phrases, which were subsequently utilised to search the appropriate databases. The keywords, along with their synonyms and variations that include alternative spellings or different tenses, are presented in Table 2.2. The researcher proceeded to integrate multiple key terms or phrases using suitable Boolean operators to carry out advanced searches, as described in Table 2.3.

Index or subject terms were analysed in the bibliography sections of the selected studies to enhance the focus of the search process. This approach enabled a more thorough and targeted search across all databases. Database-specific search strategies were developed for each database included in the review. Terms like 'nurses', 'critical care settings' and 'Venous Thromboembolism' were prioritised as keywords to capture relevant studies without narrowing the scope excessively. Recognising that similar research may use varied terminology, broader terms related to the key terms were also used to ensure no relevant studies were missed. Finally, the reference lists of all selected studies were reviewed to identify additional studies that might contribute to the literature review.

The key terms and their respective synonyms or related terms used in the search strategy are displayed in Table 2.2.

Table 2.2

Key terms and respective synonyms

Key terms	Synonyms/Related terms
Nurses	Nursing staff, Critical care nurses, ITU nurses, ICU nurses, HDU nurses
Critical care settings	Critical care, Intensive care, Intensive Care Unit, ICU, Intensive Therapy Unit, ITU, High-dependency settings, High-Dependency Unit, HDU
Venous Thromboembolism	VTE, Venous Thrombosis, Thrombosis, Deep Vein Thrombosis, DVT, Pulmonary Embolism, PE
Nursing Care	VTE assessment, VTE prophylaxis, VTE prevention, VTE management, VTE treatment
Knowledge	Nurses' knowledge, VTE knowledge, Knowledge of VTE prevention and management, Knowledge gaps in VTE care, Knowledge of VTE guidelines
Practices	Nursing practices, VTE care practices, Nursing interventions, VTE management practices, VTE prevention practices

Table 2.3 illustrates how the search was performed by integrating keywords linked to each concept. Parentheses were employed to group similar words together. Most databases feature drop-down menus that make it easy to combine keywords or phrases using Boolean operators. Moreover, to further strengthen the literature search, wildcards and truncation symbols were used.

Table 2.3

Formulating the search phrases

Keywords	Applying Boolean Operators	Applying wildcards/ truncation symbols
Nurses / Critical care settings / Venous Thromboembolism	(Nurses OR Nursing staff OR Critical care nurses) AND (critical care settings OR intensive care OR high-dependency care) AND (Venous Thromboembolism OR VTE)	(Nurse* OR nurs* staff OR critical care nurse*) AND (critical care setting* OR intensive care OR high-dependen* care) AND (Venous Thromb* OR VTE)

2.2.2 Databases

Table 2.5 indicates that searches were conducted across multiple databases. A comprehensive meta-search was performed using Hybrid Discovery (HyDi), the UM's search gateway for accessing both print and online library resources. Moreover, EBSCO, an online library accessed from HyDi, was utilised to access multiple databases simultaneously. Key databases utilised in this review included PubMed, Google Scholar, Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, and the Royal College of Nursing Library. A search was also conducted through the UM's Open Access Repository (OAR) to identify any locally published studies related to the topic. However, no relevant local studies were found, further highlighting the need for this research.

2.2.3 Eligibility Criteria

Defining inclusion and exclusion criteria is an essential practice for establishing a reliable and rigorous research protocol (Weng et al., 2010). Table 2.4 outlines these eligibility criteria, which served as a guide for systematically identifying relevant sources, conducting a structured and consistent search, and refining search results for optimal relevance. The inclusion and exclusion criteria clarified the scope and reduced ambiguity in the literature search, while specific limiters narrowed down the search based on defined parameters. Guided by the PEO elements, these criteria helped ensure that only pertinent studies were retrieved and supported the researcher in maintaining objectivity during the study selection for the literature review.

Table 2.4

Eligibility criteria and their rationale

Criteria	Inclusion Criteria	Exclusion Criteria	Rationale
Population	Studies that include nurses, ideally working in critical care settings.	Studies that include other healthcare professionals or patients.	Nurses are directly involved in VTE prevention, monitoring, and management, making their knowledge and practices critical to patient outcome.
Exposure	Studies addressing nursing care of VTE, including prevention, assessment, and management strategies implemented by nurses.	Studies focusing solely on medical, pharmacological, or surgical interventions without discussing nursing care.	Ensures the research specifically examines the nursing role in VTE care, reflecting their unique responsibilities and contributions.
Outcome	Studies reporting on nurses' knowledge and practices related to VTE care, including prevention measures, patient education, and adherence to guidelines.	Studies that do not measure or report outcomes related to nurses' knowledge or practices, or that focus on unrelated clinical skills or specialties.	Aligns with the research focus on assessing and evaluating nurses' knowledge and practices, which directly impact VTE patient outcomes.

Criteria	Inclusion Criteria	Exclusion Criteria	Rationale
Study designs	Qualitative studies, quantitative studies, cohort studies, case-control studies, mixed-methods research, case reports, cross-sectional surveys, and systematic reviews.	Case reports, newspaper articles, editorials, background information, anecdotal information, expert opinions, research proposals, incomplete studies or commentaries that do not provide primary research or detailed data.	Includes robust and diverse methodologies to ensure comprehensive analysis while excluding studies with limited evidence or relevance.
Language	Studies published in English.	Studies published in languages other than English without accessible translations.	Limits to accessible studies due to resource and time constraints while ensuring a comprehensive understanding of English-language research.
Year of Publication	Studies published from January 2000 onwards.	Studies published by the end of December 1999.	Focuses on current and relevant evidence, reflecting recent advancements in VTE care, protocols, and educational practices.

Criteria	Inclusion Criteria	Exclusion Criteria	Rationale
Publication status	Articles in full-text availability, Peer-reviewed articles, published studies, dissertations, conference proceedings.	Articles not available in full-text, non-peer-reviewed articles, unpublished studies, studies that are not accessible through direct personal communication with author/s.	Focuses on high-quality and credible sources to ensure the validity and reliability of findings.

2.2.4   The Search Strategy Plan

Table 2.5 presents the search strategy plan and the results retrieved from the accessed databases. Filters, including language, study design, publication date range, and publication status, were applied to ensure the relevance of the results. Truncations were used selectively to avoid retrieving excessive irrelevant results, and the search terms varied between databases to enhance the effectiveness of the search.

Table 2.5

Search Trail Selection

Search Engine/ Database	Search Term	Results	Filters	Results upon applying filters
Hybrid Discovery (HyDi)	**Search 1:** "Nursing care" AND "Intensive Therapy Unit" OR "ITU" AND "Venous Thromb*" AND "Knowledge" OR "Knowledge gaps in VTE care" AND "Nursing practices"	31	Date Range: 2000 – 2024 Language: English Full Text Availability Peer-Reviewed	14
	Search 2: "Nursing Staff" OR "ITU Nurses" OR "ICU Nurses" AND "Thrombosis" AND "VTE assessment" OR "VTE prophylaxis" OR "VTE treatment" OR "VTE prevention"	46	Date Range: 2000 – 2024 Language: English Full Text Availability Peer-Reviewed	22

Search Engine/ Database	Search Term	Results	Filters	Results upon applying filters
PubMed	**Search 1:** "Nurse*" AND "Critical care" OR "Critical care setting*"AND "VTE management" AND "VTE knowledge" AND "Practices" OR "VTE prevention practices"	34	Publication Date: 2000 – 2024 Text Availability: Full text Languages: English	7
	Search 2: "Nurse*" OR "HDU nurse*" OR "ITU nurse*" AND "Intensive Care Unit" OR "ICU" OR "High-Dependency Unit" OR "HDU" AND "VTE" OR "Venous thromb*" AND "Nurses knowledge" AND "Nursing interventions"	23	Publication Date: 2000 – 2024 Text Availability: Full text Languages: English	8

Search Engine/ Database	Search Term	Results	Filters	Results upon applying filters
Google Scholar	"Critical care nurses" AND "Venous thromboembolism" OR "Deep Vein Thrombosis" OR "DVT" OR "Pulmonary Embolism" OR "PE" AND "Knowledge of VTE prevention and management" AND "Nursing care"	13,443	Date Range: 2000 – 2024 Review articles Articles published in English	861
CINAHL Complete	"Nurse*" AND "Critical care" OR "Intensive care" OR "High-dependen* setting*" AND "Venous Thromboembolism" AND "Knowledge of VTE guidelines" AND "VTE care practices" OR "VTE management practices"	1,421	Full text Publication Date: 2000 - 2024 Source types: Academic journals, Reviews	152
Total number of results		14,998		1,064
Total number of results after removing duplicates				847

2.2.5 Identification and selection of studies

The PRISMA 2020 flow diagram was employed to outline the number of records identified from various sources (see Figure 2.1). These sources included prior research studies and newly identified research studies accessed through databases. Following PRISMA guidelines, the researcher documented the number of records obtained from each database and detailed the records excluded at different stages. Duplicate records were removed, and the remaining entries underwent an initial screening. Subsequent screening excluded studies that did not align with the PEO framework presented in Table 2.1.

Figure 2.1

PRISMA 2020 Flow Diagram (Page et al., 2021)

	Identification of studies via databases and registers
Identification	Records identified from: Databases (n = 14,998) → Records removed before screening: Records marked as ineligible by filters (n = 13,934) Duplicate records removed (n = 217)
Screening	Records screened (n = 847) → Records excluded (n = 801)
	Reports sought for retrieval (n = 46) → Reports not retrieved due to unavailability of full text (n = 5)
	Reports assessed for eligibility (n = 41) → Reports excluded: Reason 1: Studies are specifically focused on other healthcare professionals (non-nursing focused) (n = 9) Reason 2: Studies are specifically focused on patients (n = 14) Reason 3: Studies that target a specific nursing population/unit (i.e. not general or critical care). (n = 11)
Included	Studies included in review (n = 7)

2.2.6 Overview of Studies Included for Review

The studies included in this review were published between 2014 to 2023 (n=7). These research studies were conducted in Brazil, China, Egypt, South Korea and the US. Four of these research studies (Yu-Fen et al., 2018; Oh et al., 2017; Silva et al., 2020; Tang et al., 2015) employed a cross-sectional quantitative design, while two other studies (Mohammed et al., 2018; Lee et al., 2014) employed a descriptive exploratory quantitative design to analyse VTE knowledge and practices among nurses. The seventh research study, a systematic review conducted by Al-Mugheed and Bayraktar (2023) that did not include a meta-analysis, included fourteen studies, most of which employed convenience sampling and a cross-sectional descriptive design. These fourteen studies focused on the level of knowledge, risk assessment, attitudes, behaviours, self-efficacy, practice and recommendations of VTE. This review also incorporated the research studies by Oh et al. (2017), Silva et al. (2020), and Lee et al. (2014).

The researcher acknowledges that the studies included in this review examine the same phenomenon, albeit employing different terminologies. These studies explore nurses' knowledge and practices regarding VTE care, with varying terminology used to describe the key concepts. These include VTE prophylaxis and risk assessment (Tang et al., 2015; Mohammed et al., 2018; Oh et al., 2017), thromboprophylaxis (Yu-Fen et al., 2018), preventive care (Lee et al., 2014), and self-efficacy in VTE care (Silva et al., 2020; Al-Mugheed & Bayraktar, 2023). Some studies also focus on barriers to VTE prevention and education needs (Al-Mugheed & Bayraktar, 2023; Mohammed et al., 2018), while others address the knowledge gaps and the need for standardised training (Yu-Fen et al., 2018; Lee et al., 2014). Despite differences in terminology and study focus, all studies contribute to understanding the role of nurses in VTE prevention and management, with some studies focusing specifically on critical care settings and others examining broader hospital contexts.

The participants in the selected seven studies were predominantly nurses employed in hospital settings. While Tang et al. (2015) included both nurses and physicians as participants, the researcher focused solely on the results pertaining to nurses. The sample size across all studies ranged from 81 (Silva et al., 2020) to 8,628 (Al-Mugheed & Bayraktar, 2023) participants. Across all studies, where specified, the vast majority of participants were women. The reported average age of participants, if mentioned, ranged from 29 to 42 years. The studies conducted by Mohammed et al. (2018) and Tang et al. (2015) focused exclusively on nurses working in ICUs. In contrast, the studies by Oh et al. (2017), Silva et al. (2020),

and Lee et al. (2014) included bedside nurses while excluding administrative-level nurses and those working in paediatric, psychiatric, labour and delivery units, as well as outpatient settings. The study by Yu-Fen et al. (2018) did not provide specific details regarding participant roles or workplace settings.

The studies revealed notable variations in nurses' education, experience, and VTE-specific training, highlighting both strengths and gaps. Bachelor's degree attainment ranged from 49% (Lee et al., 2014) to 55.1% (Oh et al., 2017), with smaller proportions holding master's degrees, such as 3.6% (Lee et al., 2014) and 6.9% (Oh et al., 2017). In contrast, Mohammed et al. (2018) reported a majority (73.6%) with diploma qualifications, while Yu-Fen et al. (2018) noted that 58.37% of participants had completed continuing education. Silva et al. (2020) emphasised specialist degrees, and Tang et al. (2015) did not report on education levels. Regarding professional experience, nurses in Mohammed et al. (2018) and Lee et al. (2014) demonstrated the greatest clinical exposure. Over half of the participants in Mohammed et al. (2018) had more than 10 years of ICU experience, while nurses in Lee et al. (2014) reported an average of 13.8 ± 10.6 years of total nursing experience. Comparatively, nurses in Oh et al. (2017) had less experience, averaging 5.3 years in hospitals and 3.7 years in units, while Yu-Fen et al. (2018) reported moderate experience (8.96 ± 7.37 years).

Despite varied educational backgrounds and experience levels, participation in VTE-specific training programs was consistently low. Fewer than 10% of nurses in Oh et al. (2017) had attended in-service VTE education, while 46% in Lee et al. (2014) had received such training, with only seven rating it as excellent. Mohammed et al. (2018) showed even lower levels of training, with just 20.9% having attended VTE prophylaxis courses. Meanwhile, Silva et al. (2020) indicated slightly better engagement, with 40% of nurses having participated in VTE education programs. In contrast, Yu-Fen et al. (2018) focused broadly on continuing education but did not provide specifics on VTE-related training, while Tang et al. (2015) did not report on this aspect at all. Overall, the findings suggest that while some nurses possess advanced degrees and extensive experience, there is a consistent gap in VTE-specific training and continuing education, which could impact the effectiveness of VTE nursing care delivery. Table 2.6 provides the details for each of the final seven studies included in the literature review.

Table 2.6

Summary of the Retrieved Studies in Reverse Chronological Order

Author & Country	Aim of the study	Research Design	Sampling & Population	Data Collection	Data Analysis	Main findings
Yu-Fen et al., 2018 (China)	To determine nurses' knowledge of VTE prophylaxis through a nationwide survey across China, to understand gaps between current knowledge, and guidelines, and to help improve clinical nursing.	Quantitative, Cross-sectional descriptive	Nationwide sampling of nurses from 106 AAA-grade hospitals in China. Total respondents: n=5,218 (97.7% women). Most participants were clinical nurses working in general wards (53.5%), ICU nurses (18.6%), and OR nurses (10.1%).	Electronic questionnaire with 68 items covering 5 topics: basic knowledge, risk assessment, basic prophylaxis, physical prophylaxis, and pharmacological prophylaxis	Descriptive statistics and inferential analyses using SPSS software; Chi-squared tests for categorical variables, ANOVA for continuous variables.	- The average correct response rate was 59.9%. - Knowledge of basic prophylaxis, risk assessment, and basic knowledge was satisfactory, but physical and pharmacological prophylaxis knowledge was notably low. - ICU and highly educated nurses performed better.

Author & Country	Aim of the study	Research Design	Sampling & Population	Data Collection	Data Analysis	Main findings
Mohammed et al., 2018 (Egypt)	To assess nurses' performance regarding VTE prophylaxis in ICU settings at Zagazig University Hospital.	Quantitative, Descriptive exploratory design	Convenience sampling. ICU nurses at Zagazig University Hospitals. n=91; mostly female, married, with a diploma qualification.	Structured questionnaire and observational checklist.	SPSS software; descriptive statistics and correlation tests	- Only 27.5% had satisfactory knowledge, 56% had satisfactory attitudes, and none had satisfactory practice regarding VTE prophylaxis.
Oh et al., 2017 (South Korea)	To evaluate Korean registered nurses' knowledge, practice, and self-efficacy regarding VTE risk assessment and prevention.	Quantitative, Cross-sectional descriptive	Convenience sampling: n=452 RNs from two university-affiliated hospitals in South Korea; majority female with a mean age of 29 years.	Paper-based survey including self-rated knowledge, 55-item VTE knowledge test, and self-reported VTE practice and self-efficacy.	SPSS software; descriptive statistics and chi-square tests.	- Nurses in this study showed a very low level of perceived VTE knowledge. - Mean knowledge score was 50.93%, with low practice and confidence in VTE prevention. - Less than 10% had received in-service education.

Author & Country	Aim of the study	Research Design	Sampling & Population	Data Collection	Data Analysis	Main findings
Silva et al., 2020 (Brazil)	To compare nurses' self-perceived and objective knowledge of VTE, and identify their risk assessment practices and perceived barriers	Quantitative, Cross-sectional descriptive	Convenience sampling. Bedside nurses working in adult units at a teaching hospital in São Paulo n=81 (all age groups)	Paper-based or electronic questionnaire on knowledge, risk assessment, self-efficacy, and barriers	Descriptive statistics	- Discrepancy between self-perceived and objective knowledge of VTE, insufficient risk assessment, low self-efficacy in VTE prevention, and lack of protocols as a major barrier.
Tang et al., 2015 (China)	To explore the knowledge and practice of VTE prophylaxis among ICU medical staff	Quantitative, Cross-sectional descriptive	Convenience sampling. Medical staff in ICUs at 23 tertiary hospitals across 7 provinces n=1861 (physicians and nurses, all age groups), n=1117 nurses	Paper-based 39-question survey covering knowledge, practice, and concerns about VTE prophylaxis	Descriptive statistics, χ^2 test	- Limited knowledge of VTE prophylaxis among ICU staff, particularly nurses.

Author & Country	Aim of the study	Research Design	Sampling & Population	Data Collection	Data Analysis	Main findings
Lee et al., 2014 (United States)	To evaluate hospital nurses' knowledge and practices regarding VTE assessment and prevention	Quantitative, Descriptive exploratory	Convenience sampling. Bedside nurses from two hospitals in California n=221 (ages 18-65 years)	Web-based survey on knowledge, practices, self-efficacy, and barriers in VTE prevention	Descriptive statistics, chi-square, t-tests	- Varying knowledge levels; barriers included lack of knowledge and time; greater self-reported knowledge linked to higher assessment frequency and self-efficacy.
Al-Mugheed & Bayraktar, 2023 (Multiple countries)	To review the literature on nurses' knowledge, risk assessment practices, self-efficacy, attitudes, and behaviours towards VTE	Systematic review	14 studies, convenience sampling Nurses from various international settings n=8628 (varied age groups)	Review of existing studies (data extracted from primary studies)	Critical appraisal and synthesis of results	- Most nurses had good knowledge of VTE but poor practices in risk assessment and prevention; recommendations for continuous educational programs and standardised protocols.

2.3 Critique of Retrieved Studies

In order to assess the quality of the studies selected for this review, critical appraisal tools were used. The tools utilised were the Critical Appraisal Skills Programme (CASP) Checklist for Descriptive/Cross-Sectional Studies and the CASP Checklist for Systematic Reviews. These tools were chosen due to their reliability and their alignment with the study designs used in the selected research studies. The researcher utilised the CASP Checklist for Cross-Sectional Studies for the four studies employing a cross-sectional descriptive design and the two studies employing a descriptive exploratory design. Despite slight differences in objectives and focus, both designs share core methodological characteristics. This tool is well-suited for evaluating the rigour and validity of studies relying on single-time-point data collection, with its emphasis on methodology, sampling, data collection, and analysis ensuring a thorough appraisal of the quality of both study types. Detailed guidelines for each appraisal tool are provided in Appendix A (CASP for Descriptive/Cross-Sectional Studies) and Appendix B (CASP for Systematic Reviews). The following section provides an appraisal of the seven retrieved studies using the relevant critical appraisal tools.

2.3.1 CASP Checklist for Descriptive/Cross-Sectional Studies

2.3.1.1 Research Questions

The research questions across the six studies that utilised either a cross-sectional descriptive design or a descriptive exploratory design (Yu-Fen et al., 2018; Mohammed et al., 2018; Oh et al., 2017; Silva et al., 2020; Tang et al., 2015 and Lee et al., 2014) were generally clear and relevant, addressing key aspects of nurses' knowledge and practices regarding VTE. For instance, some studies focused on identifying knowledge gaps and aligning practices with current guidelines (Yu-Fen et al., 2018; Oh et al., 2017), while others explored broader aspects, such as self-efficacy and barriers to VTE prevention (Silva et al., 2020, Lee et al., 2014). Specific to critical care, studies like Mohammed et al. (2018) and Tang et al. (2015) investigated ICU nurses' performance, knowledge, and self-efficacy in VTE care, making their research particularly relevant to nursing practices in high-risk settings. As all six studies are aligned with the key question, the researcher decided to proceed with the appraisal.

2.3.1.2 Study Design

Yu-Fen et al. (2018) and Tang et al. (2015) used large-scale cross-sectional surveys, suitable for capturing broad insights into nurses' knowledge and practices related to VTE. Similarly, Oh et al. (2017) and Silva et al. (2020) employed a descriptive cross-sectional

design with a moderate sample, aligning well with their focus on self-efficacy and practice differences across departments. Lee et al. (2014) and Mohammed et al. (2018) utilised descriptive exploratory approaches to gain detailed insights into barriers, knowledge, and attitudes among nurses. Both were well-suited to their localised contexts, though the smaller sample size in Mohammed et al. (2018) limited its generalisability. Overall, the studies demonstrated alignment between their designs and objectives.

2.3.1.3 *Study Participants*

The six studies exhibited notable variation in their approach to participant recruitment and characteristics. None of these studies mentioned the use of a power calculation to determine the required sample size. Yu-Fen et al. (2018) involved a large and diverse sample of 5,218 nurses from 106 AAA-grade hospitals, enhancing the reliability and generalisability of its findings, though the demographic was predominantly female, limiting diversity. Similarly, Tang et al. (2015) recruited 1,861 ICU medical staff (including nurses and physicians) from 52 ICUs across seven provinces, offering robust representation but diluting the focus on nursing-specific practices due to the inclusion of physicians. The large sample sizes in these two studies ensured generalisability, earning a clear 'yes' in the CASP tool for sample adequacy. In contrast, Mohammed et al. (2018) and Silva et al. (2020) scored 'no' for generalisability due to limited sample sizes and single-site recruitment. While these studies provided focused insights, they relied on smaller, localised samples: 91 ICU nurses from a single university hospital and 81 nurses from a teaching hospital, respectively. Oh et al. (2017), with 452 registered nurses from two university-affiliated hospitals, offered moderate representation across various departments, including ICUs. However, the lack of detailed demographic data hindered a comprehensive assessment of sample diversity, leading to a 'can't tell' on representativeness. Finally, Lee et al. (2014) targeted 221 bedside nurses from two acute care hospitals. The study provided a clear sample size and demographic details, which strengthened its representativeness and earned a 'yes' for adequacy in the CASP tool. All studies recruited participants appropriately and adhered to ethical guidelines by securing informed consent and protecting confidentiality. Overall, most studies scored 'yes' for acceptable recruitment methods, but limitations in sample size or reporting clarity lowered scores in specific cases, particularly in the studies by Mohammed et al. (2018), Silva et al. (2020) and Oh et al. (2017).

2.3.1.4   Data Collection Sources and Methods

The research studies included in this review employed a variety of data collection sources and methods, primarily relying on structured questionnaires and surveys distributed to participants. Yu-Fen et al. (2018) and Tang et al. (2015) utilised nationwide surveys to collect data from large samples, ensuring comprehensive coverage of their respective populations and earning a 'yes' for alignment with study objectives and clarity of methods. Similarly, Oh et al. (2017) distributed paper-based surveys in two university-affiliated hospitals, and Mohammed et al. (2018) supplemented its questionnaire with an observational checklist, adding depth by assessing practical skills alongside self-reported knowledge and attitudes. Both studies were well-justified in their approaches, earning a 'yes' for data collection methods. Lee et al. (2014) employed an anonymous web-based survey with 221 bedside nurses and provided adequate transparency, earning a 'yes' for its clear and robust data collection process. In contrast, Silva et al. (2020), while using a structured questionnaire, lacked transparency regarding survey distribution and collection, leading to a 'can't tell' for the adequacy of its methods. Overall, most studies provided sufficient justification for their data collection methods, resulting in a majority of 'yes' responses.

2.3.1.5   Data Collection Instruments

The data collection instruments across the studies were primarily structured questionnaires, with some employing additional tools to enhance reliability and comprehensiveness. Tang et al. (2015) ensured its tool's reliability by reporting a Cronbach's alpha of 0.773, indicating acceptable internal consistency, and conducted a factor analysis yielding a Kaiser-Meyer-Olkin coefficient of 0.751, further supporting the tool's validity. This earned the study a 'yes' for its rigorous instrument validation. Lee et al. (2014), used a validated and well-structured survey tool developed by VTE research experts. The instrument was reviewed for completeness and clarity by a multidisciplinary committee, and it reported a Cronbach's alpha of 0.84, demonstrating high internal consistency. Oh et al. (2017) utilised the questionnaire developed and validated by Lee et al. (2014). Given the robust validation in the original study, additional reliability measures were not explicitly required in Oh et al. (2017), resulting in a 'yes' for validity and measurement accuracy based on the prior validation. Similarly, Silva et al. (2020) developed their questionnaire based on the one created and validated by Lee et al. (2014). However, it was then reviewed by a group of healthcare providers, who assessed and adjusted the instrument's items for clarity, theoretical relevance, and practical applicability. Silva et al. (2020) noted that no transcultural adaptation

or validation of the questionnaire was conducted, as it was designed specifically for this study's purposes. While this limits the instrument's external validity and generalisability to other settings, it does not inherently affect its internal validity for the targeted population. However, the absence of broader validation processes, such as reliability metrics, resulted in a 'can't tell' for measurement accuracy.

Mohammed et al. (2018) validated its structured questionnaire through expert content review and reported Cronbach's alpha values of 0.82, 0.93, and 0.86 for the knowledge, practice, and attitudes components of the instrument, respectively, reflecting strong internal consistency and earning a 'yes' for reliability. Yu-Fen et al. (2018) enhanced its questionnaire's validity by involving experts and achieving a Content Validity Index of 0.951, reflecting excellent content validity. However, the absence of reliability metrics, including Cronbach's alpha, resulted in a 'can't tell' for reliability testing.

2.3.1.6   Statistics

The statistical analyses across the studies were generally appropriate, with most employing descriptive and inferential methods to align with their objectives. Tang et al. (2015) demonstrated robust statistical analysis, using descriptive statistics and to support its findings, earning a 'yes' for sufficiently rigorous data analysis. Similarly, Oh et al. (2017) employed t-tests and chi-square tests, clearly presenting its findings with adequate statistical depth, which also earned a 'yes'. Lee et al. (2014) applied descriptive statistics to summarise participant responses and used inferential methods to explore relationships between variables, earning another 'yes' for rigour. Mohammed et al. (2018) utilised descriptive and inferential statistics to evaluate relationships between knowledge, attitudes, and practices, earning a 'yes' for its clear and adequate analysis. Yu-Fen et al. (2018), while relying heavily on descriptive statistics, lacked sufficient inferential methods or detailed explanation of statistical tests, resulting in a 'can't tell' for rigour. Silva et al. (2020) relied solely on descriptive statistics without employing advanced analyses, earning a 'no' for statistical sufficiency. Overall, the studies predominantly scored 'yes', but the lack of depth in Yu-Fen et al. (2018) and Silva et al. (2020) highlighted gaps in statistical robustness.

2.3.1.7   Results and Findings

The findings were generally well-presented and aligned with the research objectives, earning a 'yes' for clarity in all studies. Tang et al. (2015) and Yu-Fen et al. (2018) provided detailed statistical summaries of nurses' knowledge gaps and risk assessment practices,

highlighting significant deficiencies and areas for improvement. Oh et al. (2017) effectively reported variations in self-efficacy and practices across different nursing units, presenting clear results supported by inferential statistics. Mohammed et al. (2018) emphasised the need for educational interventions by showing correlations between knowledge and practice. However, the study's findings were less generalisable due to its small sample size and the absence of reported confidence intervals, which would have provided a clearer measure of the precision and reliability of the estimates. Despite its smaller scale, Silva et al. (2020), provided detailed findings about discrepancies between self-perceived and objective knowledge of VTE, low self-efficacy in risk assessment, insufficient prevention practices among nurses and a lack of institutional protocols, offering nuanced insights into institutional and individual challenges. Moreover, Lee et al. (2014) offered actionable insights into barriers faced by bedside nurses, with robust descriptive and inferential analysis.

2.3.1.8   *Applicability to Local Scenario*

The applicability of the findings to Malta varies across the studies due to differences in healthcare systems, cultural contexts, and nursing practices. The large-scale studies, Yu-Fen et al. (2018) and Tang et al. (2015), offer valuable insights into systemic knowledge gaps and practices that could inform national-level interventions in Malta, though differences in healthcare infrastructure may limit direct applicability. Oh et al. (2017) and Lee et al. (2014) focused on nurses' self-efficacy and barriers to practice, respectively, providing findings that could align with similar challenges faced by nurses in Malta, especially in critical care settings. Mohammed et al. (2018), while insightful in its exploration of ICU nursing, is less applicable to Malta due to its small sample size and the specific hospital context. Lastly, Silva et al. (2020), with its localised focus and limited methodological transparency, provides minimal relevance to Malta.

2.3.1.9   *Overall rating*

The overall quality of the studies varied based on adherence to methodological rigour, ethical practices, and statistical robustness. Tang et al. (2015) scored high overall, supported by its large sample size, validated instruments, rigorous statistical analysis, and adherence to ethical standards. Oh et al. (2017) also earned a high rating due to its comprehensive methodology, clear ethical processes, and sufficiently rigorous statistical approach. Lee et al. (2014), with a validated instrument, strong ethical practices, and robust statistical analysis, scored high overall despite minor limitations in sample diversity. Mohammed et al. (2018), while strong in ethical adherence and methodological alignment, received a moderate to high

rating due to its smaller sample size and reliance on descriptive statistics. Yu-Fen et al. (2018), despite its large sample size and ethical adherence, scored moderate overall due to insufficient details on instrument validation and statistical rigour. Silva et al. (2020) earned a moderate rating, as its limited sample size, lack of transparency in ethical processes, and reliance on descriptive statistics weakened its overall quality.

2.3.2 CASP Checklist for Systematic Reviews

2.3.2.1 *Validity of the Review Process*

The systematic review by Al-Mugheed and Bayraktar (2023) posed a clearly focused research question, examining nurses' knowledge, attitudes, and practices regarding VTE prevention and management. The population, (registered nurses), intervention (education or lack thereof regarding VTE), and outcomes (identifying knowledge and practice gaps) were well-defined and aligned with global healthcare priorities, earning a 'yes' for focus. The included studies were appropriate for the review's objective, consisting of cross-sectional and descriptive exploratory designs, which were suitable for evaluating knowledge and practices, leading to another 'yes' for appropriateness. The review synthesised data from 14 studies involving 8,628 nurses across multiple countries. However, the exclusion criteria and geographic limitations applied mean that the findings may not fully reflect the global state of nurses' knowledge and practices regarding VTE prevention, thereby limiting the scope and completeness of the evidence base and resulting in a 'can't tell' for the inclusion of relevant studies.

The use of the Hoy critical appraisal checklist to assess study quality was a strength, ensuring systematic evaluation of internal and external validity. This earned a 'yes' for quality assessment, however, more detail on how discrepancies between reviewers were resolved would improve transparency. A narrative synthesis was appropriately used given the heterogeneity of the included studies, but the absence of a meta-analysis limited the precision of the findings, resulting in a 'yes' for data synthesis with opportunities for improvement.

2.3.2.2 *Key Findings and Interpretation*

The results were summarised effectively, identifying moderate to high knowledge levels among nurses but significant gaps in risk assessment and the practical application of VTE prevention practices. Eleven of the 14 studies reported poor or unsatisfactory practices, emphasising the need for enhanced education and standardised protocols. These findings were clearly presented, earning a 'yes' for summary of results. However, the absence of

confidence intervals, effect sizes, or meta-analytic techniques reduced the statistical precision and reliability of aggregated conclusions, resulting in a 'can't tell' for precision. While the findings provided meaningful insights, the limited statistical rigour could have weakened their interpretability.

2.3.2.3 *Practical Applicability and Relevance*

The applicability of the findings to local settings, such as Malta, is broad but with limitations. Recommendations for improving nurses' knowledge, implementing standardised VTE prevention protocols, and enhancing risk assessment practices are universally relevant. However, the limited representation of developing regions and critical care-specific contexts may require additional tailoring to suit Malta's specific needs. This earns a partial 'yes' for applicability. The review addressed important outcomes such as knowledge gaps, risk assessment, and standardised protocols but failed to consider factors like cost-effectiveness or institutional barriers, which are crucial for practical implementation in resource-constrained settings. This results in a 'yes' for all outcomes considered, though a more comprehensive outcome consideration would strengthen its relevance. The review did not explicitly evaluate whether the benefits of implementing its recommendations outweigh the potential harms and costs, which limits its practical application, particularly in resource-constrained settings. This results in a 'can't tell' for cost/harm-benefit analysis.

2.4 Ethical implications

The ethical implications across the seven reviewed articles were generally addressed, though there were variations in the level of detail provided. Most studies obtained ethical approval from institutional review boards (IRBs) or ethics committees, ensuring compliance with ethical standards for human subject research. For instance, studies such as Yu-Fen et al. (2018) in China explicitly reported IRB approval and obtained informed consent from all participants. Similarly, Oh et al. (2017) in South Korea obtained ethical approval from the IRBs of the participating hospitals and provided anonymity through paper-based surveys. Mohammed et al. (2018) and Tang et al. (2015) also indicated approval by ethics committees, with Tang et al. (2015) emphasising anonymity in its survey design, which waived the need for informed consent. Silva et al. (2020) and Lee et al. (2014) followed similar protocols, ensuring participant confidentiality and voluntary participation in their surveys. The systematic review by Al-Mugheed and Bayraktar (2023) adhered to PRISMA guidelines, including only studies with documented ethical compliance.

Nonetheless, the systematic review did not explicitly evaluate the ethical standards of the included studies, which could raise concerns about the robustness of its evidence base in terms of participant protection. Furthermore, some studies lacked detailed reporting on specific ethical aspects, such as the measures taken to protect participant privacy during data collection or how potential biases from self-reported surveys were mitigated. While ethical standards were generally maintained, clearer and more comprehensive reporting would enhance the transparency and replicability of these studies.

2.5 Theoretical framework

The use of theoretical frameworks is essential for providing greater clarity to the results and serves as a means to minimise biases during their interpretation (Varpio et al., 2020). This study will be guided by Benner's Novice-to-Expert Model (Benner, 1984) to explore and interpret nurses' knowledge and practices in critical care settings regarding VTE nursing care. Benner's model provides a structured lens to evaluate how nurses' knowledge and practices evolve through experience and professional growth, categorising them into five proficiency levels; *novice*, *advanced beginner*, *competent*, *proficient*, and *expert*. By employing this framework, the researcher can identify patterns in how VTE-related knowledge and adherence to best practices differ across these experience levels. For example, novice nurses may rely heavily on formal protocols and guidelines, while expert nurses may demonstrate intuitive and adaptive decision-making based on years of experience.

Applying Benner's model in this research study will provide valuable insights into how clinical experience influences adherence to VTE assessment, prevention and management protocols and highlight areas where targeted interventions can enhance competency. These findings will be instrumental in developing tailored educational strategies, supporting mentorship programs, and refining hospital policies to ensure that nurses at all experience levels are well-equipped to implement effective VTE prevention measures. Ultimately, integrating this framework will contribute to improving patient safety and outcomes in critical care settings by strengthening the link between nursing experience and best practices in VTE care.

2.6 Local Studies

Local research on VTE nursing care in Malta is limited, with only eight relevant studies identified, none of which directly address the chosen research question. The first, an audit of

VTE prophylaxis in a geriatric facility, focused exclusively on doctors and assessed compliance with guidelines, finding an improvement in adherence following the implementation of a reminder system (Lofaro et al., 2013). However, despite the audit's conclusion that much more needs to be done to improve compliance with guidelines, no further audits have been conducted locally since its publication in 2013. Similarly, a poster presentation outlined an evaluation of prophylactic practices within Maltese hospitals, highlighting gaps in documentation and adherence to risk assessment protocols for VTE prevention. However, it primarily assessed physician practices without examining nursing knowledge or actions (Grech et al., 2015).

Other studies focused on diagnostic and pharmacological aspects of VTE. For instance, Riva et al. (2018) investigated the use of biomarkers such as D-dimer and sP-selectin for diagnosing VTE in acute settings, emphasising laboratory-based detection techniques over nursing practices. Similarly, Vassallo (2020) and Riva (2020) explored imaging modalities and anticoagulant treatment frameworks for managing VTE, focusing on diagnostic or pharmacological approaches without discussing the role of nursing care in prevention. A separate narrative review examined the use of direct oral anticoagulants (DOACs) for VTE in unusual anatomical sites, such as cerebral and abdominal veins, but remained centred on treatment strategies rather than prevention in critical care contexts (Riva & Ageno, 2021). Another study explored DOACs for cancer-associated thrombosis, focusing specifically on pharmacological treatment in cancer patients rather than on nursing practices or knowledge (Attard et al., 2022). Additionally, a case report by Cachia et al. (2015) provided clinical insights into a rare instance of paradoxical embolism linked to VTE but did not address nursing roles.

These studies, while valuable in their respective areas, fail to address the crucial question of nursing knowledge and practices regarding VTE in critical care settings. This significant gap underscores the need for local research that evaluates how nurses in these settings perceive, understand, and implement VTE care protocols, bridging the divide between knowledge, clinical application, and patient outcomes.

2.7 Gaps in Research

The evaluation of the seven articles identified in this literature review highlights significant gaps directly relevant to the research question. A key limitation is the lack of

focus on critical care settings, as most studies examine broader nursing populations without evaluating the unique context of critical care nurses. These challenges, such as managing high-risk patients with complex conditions, require a context specific evaluation that is currently underexplored.

Furthermore, there is a noticeable absence of clear categorisation in the sample populations of previous studies, which include diverse nursing groups but often fail to distinguish roles or specialties. This limits conclusions about how critical care nurses' unique responsibilities influence their knowledge and practices. Comparative analyses, such as evaluating knowledge and practices based on nurses' experience levels or specific critical care roles, are also absent, leaving a gap in understanding these critical dimensions.

Another crucial gap is the inconsistent measurement of nurses' knowledge and practices. While some studies employ validated tools, others provide little detail on instrument reliability or validity. Few studies offer in-depth data on specific practices such as the use of risk assessment tools, adherence to prophylaxis protocols, or documentation, all of which are key components of VTE nursing care. Most existing studies, including the present one, rely on cross-sectional designs, which provide only a snapshot of knowledge and practices at a given point in time. While this design is useful for identifying gaps and informing targeted interventions, it does not allow for tracking changes over time or evaluating the long-term impact of educational programmes and institutional protocols aimed at improving VTE care practices. These aspects could be explored in future longitudinal studies to assess how interventions influence critical care nurses' adherence to evidence-based VTE protocols (Caruana et al. 2015).

Additionally, geographic representation in existing studies is skewed toward high-income countries, often focusing on large, well-resourced healthcare systems while overlooking variations within and across different regions. This lack of diversity reduces the global applicability of the findings and their relevance to contexts such as Malta, where distinct systemic challenges, healthcare policies, and workforce dynamics may influence nurses' knowledge and practices. Finally, while ethical compliance is noted in most studies, many fail to address how biases, such as those from self-reporting, were mitigated, leaving potential gaps in the reliability of the data.

By focusing specifically on critical care nurses and utilising a validated tool to comprehensively measure both knowledge and practices, future research can address these gaps. Additionally, exploring targeted interventions, such as structured training programmes, simulation-based learning, or institutional policy enhancements, offers the potential to improve VTE prevention practices and adherence to protocols in real-world critical care settings. These contributions can provide actionable insights tailored to critical care nursing, advancing the body of knowledge and supporting evidence-based improvements in patient outcomes.

2.8 Conclusion

This chapter presented the search and appraisal of the literature related to nurses' knowledge and practices regarding VTE nursing care, with a specific focus on critical care settings. Furthermore, the theoretical frameworks guiding this research were discussed. The evidence appraised in the literature highlighted significant gaps, particularly in the context of critical care nursing, where tailored insights into VTE nursing care are limited. The review also revealed inconsistencies in the measurement of knowledge and practices, along with a lack of focus on interventional approaches and comparative analyses. Thus, by systematically identifying, appraising, and synthesising existing knowledge, the literature review underscored the need for a study that specifically addresses these gaps in the context of critical care nurses in Malta. The following chapter presents a detailed description of the methodologies employed in this research study.

Chapter 3

Research Methodology

3.1 Introduction

This chapter outlines the research design, approach, data collection process, and data analysis techniques employed to achieve the study's research aims and objectives. Additionally, it discusses the ethical considerations of the research, along with the study's strengths and limitations.

3.2 Research Problem and Purpose

As discussed in Chapter 1, VTE is a significant and preventable complication in critical care settings. However, the level of knowledge and practices among critical care nurses in Malta regarding VTE has never been empirically researched. Given the significant role nurses play in mitigating VTE risks through proper assessment, prevention strategies, and adherence to protocols, understanding their knowledge and practices is essential. While knowledge and adherence to best practices are fundamental in recognising and managing VTE, other factors, such as clinical experience, workload, institutional policies, and available resources, may also influence the accuracy and consistency of VTE assessment. Thus, this study aims to evaluate the knowledge and practices of nurses working in critical care settings in Malta concerning VTE, while also acknowledging the broader systemic and contextual factors that may impact VTE recognition and prevention. Identifying these gaps and areas for improvement can help enhance both nurse education and patient outcomes.

3.3 Research Framework

Philosophical underpinnings refer to the foundational beliefs and assumptions about knowledge, reality, and how research should be conducted. These underpin the choice of research design, methodology, and methods, guiding how researchers approach their study. Understanding these philosophical foundations ensures that the research is coherent and aligned with its aims and objectives (Duberley & Johnson, 2015).

An overview of the research framework and the philosophical underpinnings utilised in this research study is provided in Table 3.1 below.

Table 3.1

Overview of the research framework and the philosophical underpinnings

Research Component	Term	Justification
Philosophical Paradigm	Post-positivism	Post-positivism acknowledges the existence of an objective reality but considers that findings may be influenced by biases or context.
	Critical Realist Perspective	Objective truths about nursing knowledge and practices exist, but they are shaped by individual perceptions, experiences, and the contexts within healthcare settings.
Research Approach	Quantitative, Deductive	The quantitative approach focuses on measurable, numerical data to evaluate critical care nurses' knowledge and practices, whilst the deductive approach tests specific hypotheses based on existing theories.
Research Design	Cross-Sectional design	A cross-sectional design captures data at a single point in time, suitable for identifying trends in nurses' perceived knowledge and practices.
Research Method (Data collection)	Anonymous, structured questionnaires	Structured questionnaires provide a consistent and standardised way to collect measurable data on perceived knowledge and practices, ensuring anonymity to encourage honest responses.
Data Analysis	Descriptive and inferential statistics	Quantitative analysis methods are appropriate for summarising patterns in the data and identifying relationships between variables, aligned with the study's aims.

3.4 Epistemological and Ontological Consideration

This research study adopted a post-positivist philosophical paradigm, which informs both its epistemological and ontological foundations. Post-positivism assumes the existence of an objective reality, such as the knowledge and practices of critical care nurses regarding VTE nursing care, but acknowledges that this reality can only be partially understood due to the influence of biases, perceptions, and contextual factors (Guba & Lincoln, 1994).

Ontologically, the research adopts a critical realist perspective, recognising that while objective truths about nursing knowledge and practices exist, they are shaped by individual perceptions, professional experiences, and the diverse contexts within healthcare settings. This aligns with Schwandt's (1994) view of reality as pluralistic, encompassing multiple layers of interpretation and meaning. Moreover, Phillips and Burbules (2000) emphasise that all observations are inherently influenced by the theoretical and contextual lens through which they are made. This research study reflects these principles through the use of a structured questionnaire designed to capture measurable perceptions while accommodating variability in responses. Acknowledging that perceptions of knowledge and practices introduce subjectivity, the post-positivist paradigm accommodates these contextual and individual differences, which enhances the study's ability to account for variability across respondents.

Epistemologically, the study adheres to the post-positivist principle that knowledge is derived from empirical observation and refined through systematic testing (Weaver & Olson, 2006). This approach emphasises the collection of measurable data through a structured, anonymous questionnaire, enabling the study to evaluate perceived knowledge and practices systematically and provide reliable, quantifiable insights. Furthermore, post-positivism supports the potential for generalisation by identifying trends and patterns in the data, while acknowledging that findings are probabilistic rather than absolute truths. Popper (1959) highlights the importance of falsifiability in this paradigm, where theories and hypotheses are continuously tested and adjusted rather than conclusively proven. This aligns with the deductive approach adopted in this research, where hypotheses about relationships between nurses' knowledge and practices are evaluated using quantitative methods.

Post-positivism also acknowledges the potential influence of researcher assumptions and bias on the research process, particularly in this study, as the researcher is also a nurse

working in an HDU. This setting closely aligns with the critical care environments examined in the study, providing the researcher with firsthand experience of the challenges and realities of VTE care in practice. This professional background has shaped the researcher's worldview, particularly in recognising the importance of structured protocols, the role of clinical judgment, and potential barriers such as workload pressures, varying adherence levels, and gaps in hospital policies.

While this insider perspective offers valuable insights, it also introduces the risk of bias in data interpretation due to personal experiences. To address this, reflexivity was incorporated throughout the research process, involving critical self-awareness and ongoing reflection on how the researcher's personal beliefs, professional experiences, and assumptions might influence study design, participant interactions, and data interpretation. By adopting a reflexive approach, the researcher aimed to minimise unintentional bias, ensuring that findings remain data-driven rather than shaped by personal perspectives.

In line with post-positivist principles, efforts were made to enhance objectivity while acknowledging the limitations of quantitative research. The questionnaire used in this study was adapted from a validated tool, selected following a comprehensive literature review to ensure its relevance. Additionally, independent statistical analyses were conducted to strengthen the credibility of the findings, as recommended by Trochim and Donnelly (2008). However, while statistical analysis enhances objectivity, interpretation of the results must also consider contextual influences, including institutional policies, workload, and varying adherence levels, all of which may impact nurses' responses.

Moreover, it is important to recognise that quantitative tools themselves are not entirely free from bias, as they are developed by researchers who embed their own assumptions into question design, response structures, and the constructs being measured. As such, the study remains aware of the limitations of self-reported data, where participants may unintentionally overestimate or underreport their adherence to VTE nursing care. Initially, a qualitative method was considered for its potential to capture deeper insights into nurses' experiences about knowledge. However, after considering the study aim and objectives, this approach was not congruent with the research question. Thus, a quantitative approach was ultimately chosen to allow for a broader evaluation of knowledge and practices among critical care nurses.

By integrating these ontological and epistemological considerations, the study ensures a coherent framework for understanding both the measurable aspects of nursing knowledge and the subjective factors influencing practices. This alignment supports the study's aim of contributing meaningful insights into the quality of nursing care and its impact on VTE assessment and prevention.

3.5 Research Approach and Design

This research study adopted a quantitative research, which is appropriate for systematically evaluating measurable aspects of critical care nurses' perceived knowledge and practices regarding VTE care. Quantitative research emphasises the objective collection and analysis of numerical data to identify patterns, relationships, and trends within the target population (Creswell & Poth, 2018). By employing a structured questionnaire, the study ensures consistency and reliability in data collection, enabling the derivation of meaningful and generalisable conclusions. This aligns with Bryman's (2016) assertion that quantitative research relies on standardised tools to produce findings that are generalisable to broader populations. Furthermore, the quantitative approach complements the study's post-positivist paradigm, which emphasises objectivity and empirical observation while acknowledging contextual influences.

Furthermore, a deductive approach was employed in this study, as it facilitates the systematic testing of pre-existing theories and hypotheses related to knowledge and practices in the context of VTE. This approach is particularly appropriate for studies grounded in established literature and theoretical frameworks, where the aim is to evaluate specific relationships or predictions using empirical data (Morse & Mitcham, 2002).

A cross-sectional design was chosen to complement the quantitative approach, considering both its suitability for the research objectives and the time constraints of the study. Cross-sectional studies are particularly effective for capturing data at a specific point in time, providing a snapshot of the current knowledge and practices of critical care nurses (Kesmodel, 2018). This design is efficient and practical for evaluating the prevalence of specific characteristics within a population, such as levels of knowledge or adherence to VTE prevention protocols. Given the limited timeframe to conduct this research, a cross-sectional design offers a timely way to identify trends and associations between variables, providing insights that are immediately relevant to improving nursing practices and patient care in critical care settings.

3.6 Research Method

This study employed a survey method as the primary data collection tool using a structured, anonymous questionnaire. This method was selected for its ability to provide reliable and quantifiable data, essential for systematically evaluating patterns and relationships within the target population. The use of closed-ended questions ensured consistency across responses, facilitating robust statistical analysis. Additionally, the questionnaire enabled an objective assessment of critical care nurses' knowledge and practices regarding VTE nursing care. By combining its structured format with the ability to capture variability in perceptions among respondents, it served as an effective and practical tool within the broader survey framework for addressing the study's aims and objectives

Throughout the research period, participants' confidentiality and anonymity were strictly ensured. To facilitate truly anonymous data collection, no direct contact occurred between the researcher and participants. Charge nurses of each ward acted as intermediaries in the distribution of the questionnaires. The surveys were provided in blank envelopes, which participants could seal upon completion. A designated collection box was placed in the charge nurses' office, allowing participants to securely deposit their sealed envelopes. Moreover, no identifiable demographic information was recorded, and since the survey was entirely paper-based, no IP addresses or digital identifiers were collected, ensuring that no electronic traces linked responses to individuals. After the researcher collected the data, all anonymous responses were securely stored in a locked file cabinet. Anonymity further enhanced the credibility and reliability of the data by reducing social desirability bias and encouraging honest responses, while also improving the generalisability of the results, as emphasised by Bloomfield and Fisher (2019).

3.7 Development of the Tool

A validated tool developed by Lee et al. (2014) (Appendix C) to assess clinical nurses' knowledge and practices regarding VTE was utilised in this study, as its objectives closely aligned with the research aims of this study. Additionally, since the tool was originally developed in English, translation was not required. Permission to use the tool was obtained from the corresponding author, who highlighted that the original questionnaire was based on the 2008 ACCP guidelines. The author also suggested that the questionnaire be updated to reflect the most recent ACCP VTE prevention and treatment guidelines and modified to align with the researcher's local clinical guidelines.

In accordance with this guidance, the questionnaire did not require amendments based on the most recent ACCP recommendations on VTE prevention and treatment, as outlined in the *CHEST Guideline and Expert Panel Report: Antithrombotic Therapy for VTE Disease – Second Update*, published in August 2021, as it was already aligned with these guidelines. However, the questionnaire was adjusted to reflect local practices in Malta. Specific changes included the removal of answers such as 'Impedance plethysmography' and 'venography,' from the list of diagnostic options, as these tests are not performed in Malta. Furthermore, the demographic section was altered to better suit the context of this study, ensuring the data collected was relevant and aligned with the research objectives. The areas where changes were required are highlighted in Appendix D. These updates were minor, ensuring that the tool remained reliable while being contextually appropriate for the specific healthcare setting.

The final questionnaire consisted of two main sections and was designed to take approximately 15 minutes for each nurse to complete. The first section gathered demographic information, including participants' age, gender, education level, professional experience, and current workplace setting. This information provided a basis for analysing the relationship between demographic variables and nurses' knowledge and practices. The second section explored participants' knowledge and practices regarding VTE nursing care. It included questions assessing their understanding of VTE risk factors, signs, and symptoms, as well as their confidence in performing risk assessments and educating patients about prevention strategies. Additionally, questions addressed the perceived barriers to performing VTE risk assessments and evaluated participants' practices regarding mechanical and pharmacological prophylaxis.

3.8 Validity and Reliability of the Tool

The original questionnaire by Lee et al. (2014) was a validated tool that demonstrated high levels of validity and reliability in its original application, with a Cronbach alpha of 0.84 for the self-efficacy portion of the survey. To ensure content validity, the modifications were carefully aligned with the most recent ACCP VTE prevention and treatment guidelines as well as local clinical guidelines in Malta. These adjustments ensured the tool's relevance and appropriateness for the study population. Specific adaptations, such as the removal of outdated diagnostic tests and the tailoring of demographic questions, helped maintain the questionnaire's focus on meaningful and context-specific data.

The reliability of the tool was supported by its structured design, which employed closed-ended questions, including Likert scales, dichotomous responses, and multiple-choice formats. Although modifications were made to align the tool with local clinical practices, these changes were minor and did not compromise the validity or reliability of the original tool. The foundational rigor of the instrument was preserved despite these adaptations.

3.8.1 Pilot study

A pilot study was conducted with ten nurses working outside critical care settings to assess the clarity, relevance, and comprehensibility of the questionnaire used in this study. Participants were asked to provide feedback on the wording, structure, and any ambiguities, helping to identify potential areas for improvement. Based on their input, no adjustments were needed to improve question phrasing or ensure alignment with the study's objectives. This pilot study helped confirm that the questionnaire was suitable for distribution to the target population without the need for further refinement.

3.9 Population and Sampling

3.9.1 Target Population

The target population refers to the specific group of individuals that the researcher aims to study and from whom conclusions will be drawn (Zhao et al., 2013). This research study included nurses working in critical care settings within an acute hospital in Malta. These units comprised intensive care, cardiovascular critical care and HDUs.

3.9.1.1 Inclusion Criteria

Inclusion criteria were established to ensure that the sample consisted of individuals with relevant experience and knowledge. Participants were required to be registered nurses currently working in critical care settings within an acute hospital in Malta, with at least six months of experience in these units prior to data collection in January 2025. These criteria ensured that participants had sufficient exposure to VTE-related practices to provide meaningful responses.

3.9.1.2 Exclusion Criteria

Nurses not directly involved in critical care, as well as those with less than six months of experience in critical care, were excluded. Other healthcare professionals were also excluded to maintain the study's focus on nursing as a distinct profession, as it falls within nurses' scope of practice to provide continuous patient monitoring, conduct routine risk assessments,

and often be the first to recognise early signs of VTE, such as changes in a patient's mobility, vital signs, or clinical condition. Additionally, nurses are directly responsible for implementing preventive interventions. Their close, ongoing interaction with patients makes them uniquely positioned to ensure adherence to VTE prevention protocols and escalate concerns to the multidisciplinary team. By focusing on critical care nurses, this study aims to evaluate their specific knowledge and practices in VTE care, recognising their distinct clinical responsibilities and their impact on patient outcomes.

3.9.2   Sampling Strategy

A whole population sampling approach was used, as the questionnaire was distributed to all nurses working in critical care settings at an acute hospital in Malta who met the inclusion criteria. This approach ensured the inclusion of all critical care settings and nurses in Malta, reducing the likelihood of selection bias and enhancing the generalisability of the findings to the broader population.

Whole population sampling was chosen due to the manageable size of the population and its relevance to the study's objectives. Additionally, this method was particularly suitable given that critical care nurses represent a specialised and well-defined professional group, making it feasible to include all eligible participants.

3.9.3   Sample Size

To ensure the study's rigor, it was essential to include an appropriate number of participants to draw confident and reliable conclusions. An appropriate sample size enhances the reliability and validity of the information obtained (Lakens, 2022). Similarly, Andrade (2020) emphasises that an under-sized study lacks the capability to produce meaningful outcomes, whereas an over-sized study may unnecessarily consume resources. For this study, a reliable online tool, the 'Sample Size Calculator', was used to determine the appropriate sample size. This software is widely utilised in research to ensure methodological accuracy in sample size estimation. Based on this calculation, a sample size of 95 was required from a total population of 125 critical care nurses, with a 95% confidence level and a 5% margin of error. This ensured sufficient representation to meet the study objectives and conduct meaningful statistical analyses.

3.10   Data Collection

Data collection for this study was conducted using printed copies of a structured, anonymous questionnaire. Once the tool and sample were established, the questionnaires were prepared, and an email was sent to the Nursing Officers of each critical care ward to inform them about the study and their role in facilitating the process. Following this, the questionnaires were distributed to the Nursing Officers, who kindly assisted by providing them to the nursing staff in their respective wards on behalf of the researcher. The questionnaires were provided in blank envelopes, allowing participants to seal their completed responses for confidentiality. An information letter was attached to each questionnaire to explain the study's aim and invite participants to take part in the research. The letter also emphasised the voluntary nature of participation and provided assurances of confidentiality and anonymity, highlighting the importance of providing honest responses to ensure the integrity of the research.

To further ensure anonymity and confidentiality, a designated collection box was placed in the Nursing Officers' office for completed questionnaires. Participants were instructed to place their sealed envelopes into these boxes, which were collected by the researcher at a time arranged for the Nursing Officers' convenience. The data collection period spanned one month, providing ample time for participants to complete and return the questionnaire. To address any potential non-responses, an email was sent to the Nursing Officers after two weeks, encouraging them to remind their staff to participate. This process facilitated an efficient and ethical approach to gathering responses, ensuring the privacy and comfort of all participants while supporting the study's objectives.

3.11   Data Analysis

The data collected through the structured questionnaire was analysed using descriptive and inferential statistics to address the study objectives and help identify trends. The responses were first entered into Microsoft Excel for organisation and then analysed using a statistical programme called Statistical Package for Social Science (SPSS) Version 29.0. Descriptive statistics, including frequencies, percentages, and measures of central tendency, were used to summarise nurse demographics and the overall knowledge levels and current practices of nurses regarding VTE risk factors, assessment and prevention. Moreover, inferential statistics were used to test whether factors like experience or training are significantly associated with higher knowledge scores or better practices. Non-parametric tests such as the Mann-Whitney

U, Kruskal-Wallis H, Kendall's Tau-b, and Chi-Square were employed based on the data type and distribution to determine associations and differences. A professional statistician was consulted to provide guidance on the selection and application of appropriate statistical tests; however, the overall data analysis was conducted independently by the researcher.

3.12 Ethical considerations

Ethics in research is essential to ensure the integrity, reliability, and societal value of scientific inquiry. It provides a framework for conducting studies responsibly, safeguarding participants' rights and welfare while maintaining trust in the research process. By adhering to ethical principles, researchers ensure that their findings are credible, unbiased, and beneficial (Correia, 2023). This study was conducted in accordance with the UM's guidelines for ethical research, which emphasise the importance of informed consent, participant confidentiality, and data protection. Additionally, the study aligns with the ethical principles outlined in the Declaration of Helsinki (2024), which governs research involving human participants by upholding principles of autonomy, beneficence, and justice.

Ethical approval and compliance with data protection regulations were critical aspects of this study. A proposal was submitted to the FREC of the Faculty of Health Sciences, which granted ethical clearance. Data protection approval was also obtained from the Data Protection Officer at the respective acute hospital to ensure adherence to privacy regulations. Additionally, institutional approvals were secured from the Chief Executive Officer of the acute hospital, the Chairperson of the Surgical Department, the Chairperson of the Cardiology Department, the Chairperson of the Intensive Care Department, and the Director of Nursing. These approvals ensured the study could proceed within the designated hospital settings while safeguarding participants' confidentiality and safety.

For this study, consent was implied through completion, meaning that by completing and submitting the questionnaire, participants provided their consent to take part in the research. Participants were provided with an information letter attached to the questionnaire, informing them that their responses would be collected anonymously, with no identifying information recorded. To further safeguard participant confidentiality, completed questionnaires were sealed in envelopes and deposited in designated collection boxes accessible only to the researcher. All anonymous data collected will be securely stored in a locked file cabinet and used solely for the purposes of this study. These measures ensured adherence to ethical

principles, including respect for autonomy, beneficence, non-maleficence, and justice, while fostering a secure and ethical environment for data collection.

3.13   Strengths and Limitations of the Study

This study possesses several strengths that contribute to its reliability and validity. The use of a structured, validated questionnaire ensures that the data collected are standardised, quantifiable, and suitable for robust statistical analysis. Aligning the questionnaire with updated clinical guidelines and tailoring it to the local context increases its relevance to the target population. The cross-sectional design, a widely used and efficient research design for assessing knowledge and practices, allowed the study to capture a snapshot of critical care nurses' perceptions at a specific point in time. Additionally, the sampling strategy used minimised selection bias and increased the representativeness of the findings. Confidentiality and anonymity were emphasised throughout the data collection process, encouraging honest responses and minimising social desirability bias. These measures, combined with the systematic application of a deductive, quantitative approach, enhanced the study's credibility and rigor.

However, the study also acknowledges several limitations. The reliance on self-reported data may introduce bias, as participants' perceptions may not fully reflect their actual knowledge or practices. The cross-sectional design and quantitative approach, while practical, limit the ability to infer causal relationships between variables and do not facilitate the exploration of in-depth qualitative insights, such as the underlying reasons behind nurses' knowledge gaps or practices. Contextual factors, such as the specific healthcare settings and the cumulative experience of nurses in critical care units, may limit the generalisability of the findings to other settings or populations. Furthermore, despite employing a whole population sampling strategy, time constraints and the voluntary nature of participation may have influenced the rate of responses, potentially introducing non-response bias.

To address these limitations, certain strategies were implemented. In addition to guaranteeing confidentiality and anonymity, participants were given a full month to complete the questionnaire. This extended timeframe was intended to increase the response rate and encourage honest answers. In line with the post-positivist paradigm, the findings were interpreted as indicative trends rather than absolute truths, recognising the variability and complexity inherent in human behaviour and professional practices. Despite these limitations,

the study provides meaningful insights into critical care nurses' knowledge and practices regarding VTE, offering a valuable foundation for future research and targeted interventions.

3.14   Conclusion

This chapter outlined the methodology employed in this study, justifying the chosen philosophical paradigm, research design, approach, and method to address the research aims and objectives. It provided detailed accounts of the sampling strategy, data collection process, and data analysis techniques, ensuring reliability and validity throughout the research. Additionally, ethical considerations were discussed, highlighting measures to protect participants' rights, confidentiality, and anonymity. The chapter concluded by addressing the strengths and limitations of the study, offering a transparent basis for interpreting the results. The following chapter will present an analysis of the findings, processed and interpreted using the SPSS software.

Chapter 4

Results

4.1 Introduction

This chapter presents a detailed analysis of the research study's findings, based on data collected through the distributed questionnaires and analysed using IBM SPSS Statistics. The chapter opens with an overview of the participants' demographic characteristics, including age, gender, educational attainment, years of experience, workplace setting and country of education. This is followed by an analysis of the responses related to VTE knowledge and practices. Both descriptive and inferential statistical analyses were conducted to evaluate patterns, relationships, and influencing factors. The results are aligned with the study's aim to assess critical care nurses' knowledge and practices regarding VTE, identify gaps, and inform recommendations for improving clinical practice and education.

4.2 Demographic Profile of Participants

Of the 125 nurses working in critical care settings who were eligible to participate, 98 returned completed questionnaires, yielding a response rate of 78.4%. This response not only meets but slightly exceeds the required sample size of 95 participants, which was calculated based on a 95% confidence level and a 5% margin of error, ensuring adequate power for statistical analysis. The following section provides an overview of the demographic characteristics of the participants.

As shown in Table 4.1, the largest proportion of respondents fell within the 26–35 age category, accounting for 48% of the sample, followed by 15.3% in both the 18–25 and 36–45 age groups. Participants aged 46–55 made up 14.3%, while 7.1% were over 56. The majority of participants were female (61.2%), with males accounting for 38.8%. In terms of educational attainment, 56.1% held a Bachelor's degree, 27.6% a Master's degree, and 16.3% a Diploma. No participants reported holding a doctoral degree. Additionally, 82.7% of respondents had completed their nursing education in Malta, while 12.2% qualified in non-EU (European Union) countries and 5.1% in other EU nations, indicating a predominantly locally educated nursing workforce within the sample surveyed.

Table 4.1

Demographic Characteristics of Participants (n = 98)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	18–25	15	15.3%
	26-35	47	48.0%
	36-45	15	15.3%
	46-55	14	14.3%
	>56	7	7.1%
Gender	Male	38	38.8%
	Female	60	61.2%
Highest Level of Education	Doctoral Degree	0	0.0%
	Diploma	16	16.3%
	Master's Degree	27	27.6%
	Bachelor's Degree	55	56.1%
Country of Nursing Education	Another EU Country	5	5.1%
	Non-EU Country	12	12.2%
	Malta	81	82.7%

The participants in this study represented a diverse range of professional experience, with nearly half having over 10 years of nursing experience. Notably, no respondents reported having between 6 to 12 months of experience, which may reflect the staffing structure within critical care environments, where nurses are typically transferred into these units after gaining general ward experience, rather than entering directly upon qualification.

Most participants were employed in the ITU, which accounted for 58.2% of the sample. Smaller proportions worked in the SHDU (17.3%), CCCU (13.3%), and CICU (11.2%). This distribution reflects the actual staffing structure within the hospital, as more nurses work in the ITU compared to the smaller, more specialised units. Notably, response rates from the smaller units (SHDU, CCCU, and CICU) were near complete, suggesting that the majority of nurses from these areas participated in the study. In contrast, a lower proportion of ITU

nurses returned the questionnaire despite their greater numbers. While this may have influenced the relative representation from each unit, the sample still offers a broadly accurate reflection of the workforce composition across critical care settings.

When considering experience in their current unit, over a third (34.7%) had worked there for 4-6 years, and 25.5% had more than 10 years of experience. The fewest participants had worked in their current unit for 7-10 years (8.2%), highlighting a varied range of familiarity with unit-specific practices. These findings are summarised in Table 4.2.

Table 4.2

Professional Experience and Unit Distribution of Participants (n = 98)

Variable	Category	Frequency (n)	Percentage (%)
Total Nursing Experience	6–12 months	0	0.0%
	1–3 years	9	9.2%
	4–6 years	20	20.4%
	7–10 years	23	23.5%
	>10 years	46	46.9%
Current Unit of Work	CICU	11	11.2%
	CCCU	13	13.3%
	SHDU	17	17.3%
	ITU	57	58.2%
Experience in Current Unit	6–12 months	19	19.4%
	1–3 years	12	12.2%
	4–6 years	34	34.7%
	7–10 years	8	8.2%
	>10 years	25	25.5%

4.3 Descriptive Statistics: Knowledge and Practices of VTE

The questionnaire, adapted from Lee et al. (2014), was designed to assess critical care nurses' knowledge and practices related to VTE risk assessment, prevention, and management. It began with a yes/no question on prior attendance at VTE-related courses, followed by an item asking respondents to rate the quality of information received during such training, if applicable. Participants were also asked to rate their own knowledge of VTE risk assessment on a 5-point Likert scale, as well as their perception of their colleagues' knowledge.

The practice section included a multiple-choice question on assessment frequency, a checklist of eight potential barriers, with the option to add others, and a 5-point Likert scale measuring their confidence across six VTE-related interventions.

In the knowledge section, participants were asked to classify a range of VTE risk factors as either predisposing/genetic or acquired/circumstantial. This was followed by a checklist of eight possible signs and symptoms of DVT, and another with nine symptoms of PE. Two multiple-choice items assessed knowledge of the appropriate initial diagnostic tests for DVT and PE. The section also included 12 true/false statements covering risk factors, contraindications, and pharmacological and mechanical prophylaxis.

The final item (Question 13) served as a self-report integrity check, asking participants whether they had sought help or used external sources to answer the questionnaire. The complete questionnaire is provided in Appendix D. The following section presents a descriptive analysis of participants' responses, including mean scores, standard deviations, and frequency distributions.

4.3.1 Attendance in VTE-Related Courses and Self-Rated Quality of Information Provided

Participants were first asked whether they had attended a course or in-service programme that provided information on VTE risk assessment and prevention. As shown in Table 4.3, the majority of respondents indicated that they had not attended any such training, while 21.4% reported having received formal education on VTE. For those who had attended a VTE-related training, participants were then asked to rate the quality of the information provided. The ratings of these respondents are presented in Table 4.4.

Table 4.3

Attendance in VTE-Related Courses

Courses Attendance	Frequency (n)	Percentage (%)
Yes	21	21.4%
No	77	78.6%

Table 4.4

Self-rated Quality of Information Provided

Quality of Information (Only Those Who Attended, n = 21)	Frequency (n)	Percentage (%)
Excellent	5	23.8%
Very Good	6	28.6%
Good	9	42.9%
Fair	1	4.8%
Poor	0	0%

These findings suggest that a large proportion of participants had not received formal VTE education, highlighting a potential gap in professional development opportunities related to VTE prevention and management. However, among those who had attended courses, the majority rated the quality of information positively, with most responses falling within the *Good* to *Excellent* range.

4.3.2 Self-rated knowledge of VTE risk assessment

Participants were asked to rate their overall knowledge of VTE risk assessment. As shown in Table 4.5, the majority rated their knowledge as *Good*, followed by *Very Good* and *Fair*. Only a small number rated their knowledge as *Excellent* or *Poor*. This distribution suggests that most participants considered themselves to have a moderate to high level of knowledge about the subject.

Table 4.5

Self-Rated Knowledge of VTE Risk Assessment

Self-Rated Knowledge	Frequency (n)	Percentage (%)
Excellent	5	5.1%
Very good	28	28.6%
Good	50	51.0%
Fair	14	14.3%
Poor	1	1.0%

4.3.3 Perceived Knowledge of VTE Risk Assessment of Other Nurses in the Unit

Participants were also asked to rate the VTE risk assessment knowledge of other nurses in their unit. The majority rated their colleagues' knowledge as *Good*, followed by *Very Good* and *Fair*, with fewer selecting *Poor* or *Excellent*. As shown in Table 4.6, this distribution closely mirrors participants' self-ratings, suggesting that nurses generally perceived both their own and their colleagues' knowledge as moderate to high.

Table 4.6

Perceived Knowledge of VTE Risk Assessment of Other Nurses

Perceived Knowledge of Other Nurses	Frequency (n)	Percentage (%)
Excellent	3	3.1%
Very good	22	22.4%
Good	50	51.0%
Fair	15	15.3%
Poor	8	8.2%

4.3.4 Practices Related to VTE

The practice section of the questionnaire explored how frequently nurses engage in VTE-related assessments and interventions, as well as their confidence in performing these tasks. It assessed the regularity of conducting VTE risk assessments, the barriers that may hinder such practices, and self-efficacy in delivering specific prevention and education interventions. Responses were collected using Likert scales and multiple-response items, providing insight into both clinical behaviours and perceived competence.

4.3.4.1 *Frequency of Performing VTE Risk Assessments*

Participants were asked how often they perform VTE risk assessments on their patients, with responses ranging from *Never* to *For all of my patients*. The majority reported performing risk assessments for *most of their patients*, followed by those who indicated they did so *for all of their patients*. Fewer participants performed assessments for *about half of their patients*, and a smaller proportion reported doing so infrequently, with some selecting *Rarely* and just one indicating *Never*. This highlights variability in routine VTE risk assessment practices across the sample, with a notable portion not performing assessments consistently for their patients, as displayed in Table 4.7. This potentially indicates lack of guidelines or measures to promote VTE risk assessments within the specific clinical settings.

Table 4.7

Frequency of Performing VTE Risk Assessments

Frequency of VTE Risk Assessments	Frequency (n)	Percentage (%)
Never	1	1.0%
Rarely	17	17.3%
For about half of my patients	22	22.4%
For most of my patients	34	34.7%
For all of my patients	24	24.5%

Participants were asked to identify the barriers they encounter when conducting VTE risk assessments. This was a multiple-response item, meaning participants could select more than one option. The most frequently cited barriers were *limited knowledge or training on VTE* and *unclear guidelines or protocols*, each selected by 42 participants. Other commonly reported obstacles included *high patient workload*, *lack of time*, and *unavailability of assessment tools or resources*. No participants selected the *Other* option.

These results highlight a combination of knowledge, structural, and organisational barriers that may impact nurses' ability to consistently conduct VTE risk assessments in critical care settings. Table 4.8 displays the frequency of reported barriers to performing VTE risk assessments.

Table 4.8

Barriers to Performing VTE Risk Assessments

Barrier	Frequency (n)
Limited knowledge or training on VTE	42
Unclear guidelines or protocols for VTE risk assessment	42
High patient workload	39
Lack of time	27
Unavailability of assessment tools or resources	27
Lack of confidence in performing VTE assessments	19
Lack of support from colleagues or supervisors	10
Belief that VTE risk assessment is unnecessary for some patients	7
Other (as specified by participants):	0

To further understand the extent of perceived obstacles, the number of barriers selected by each participant was examined. On average, participants selected 2.17 out of 8 possible barriers, with selections ranging from 1 to 6, as shown in Table 4.9.

Table 4.9

Descriptive Statistics for Number of Barriers Selected per Participant

Statistic	Value
Mean	2.17
Median	2
Std. Deviation	1.22
Minimum	1
Maximum	6

The distribution of how many barriers were selected is presented in Table 4.10. Most participants identified only one or two barriers, while smaller proportions selected three to five. Only one participant reported six barriers, and none selected all eight. These findings suggest that although many nurses recognised a few key challenges, a smaller subset experienced a broader range of obstacles. This distribution offers additional context for interpreting the overall barrier frequencies reported in Table 4.8, suggesting that participants' selections were generally spread across the sample rather than concentrated among a few individuals.

Table 4.10

Frequency of Participants by Number of Barriers Selected

Number of Barriers	Frequency (n)	Percentage (%)
1	35	35.7%
2	33	33.7%
3	15	15.3%
4	9	9.2%
5	5	5.1%
6	1	1.0%

4.3.4.3 Self-Efficacy in VTE Prevention and Education

Participants rated their confidence in performing various VTE-related tasks using a 5-point Likert scale ranging from *Never* (1) to *Always* (5). The highest confidence was reported for *educating patients and their families about the signs, symptoms, and treatment of DVT and PE*, followed closely by *educating patients on the use and safety of oral anticoagulants*. Lower confidence levels were observed in *advising patients on lifestyle modifications* and in the *application of mechanical prophylactic devices*. These findings, presented in Table 4.11, indicate that while participants generally feel confident in VTE prevention and education, there may be a need for additional training in tasks requiring technical or behavioural skills, such as advising at-risk patients to make lifestyle changes or applying mechanical prophylaxis.

Table 4.11

Mean Confidence Scores for Self-Efficacy in VTE Prevention and Education

Task	Mean	Std. Deviation
Conduct a thorough VTE risk assessment	3.40	0.86
Educate the patient on the proper use, potential side effects, and safety precautions of oral anticoagulants	3.63	0.84
Effectively use and appropriately fit mechanical devices for VTE prevention (e.g., graduated compression stockings or intermittent pneumatic compression)	3.19	0.88
Educate patients and their families about the signs and symptoms of DVT and PE, as well as the prevention and treatment options available	3.67	0.88
Advise and motivate at-risk patients to make lifestyle changes (e.g., weight loss, smoking cessation, and regular exercise)	2.84	0.91
Encourage early mobilisation and leg exercises, particularly in at-risk patients such as post-surgical patients	3.23	0.81

4.3.4.4   *Overall Practice Score*

To provide a broader view of participants' confidence in practice, an overall practice score was computed by summing the six self-efficacy items related to VTE assessment, prevention, and education, with a maximum possible score of 30 (where each item was rated on a Likert scale from 1 to 5, with 5 representing *Always*). The total scores ranged from 9 to 27, with a mean of 19.97 (SD = 3.67) and a median of 20, as shown in Table 4.12. From this point onward, whenever the overall practice score is mentioned, it is referring to the score derived solely from Question 6 of the questionnaire, as this question exclusively assessed self-efficacy in VTE prevention and related practices.

Table 4.12

Descriptive Statistics for Overall Practice Score

Statistic	Value
Mean	19.97
Median	20
Std. Deviation	3.67
Minimum	9
Maximum	27

The distribution of total practice scores is illustrated in Figure 4.1. The distribution appears approximately normal, with a slight skew towards the lower end, indicating that while most nurses reported moderate-to-high confidence in their VTE-related practices, a subset of participants scored noticeably lower. The presence of lower scores (as low as 9) suggests that some nurses may have substantial gaps in their perceived ability to perform VTE-related assessments and interventions, reinforcing the need for targeted education and training programmes.

Figure 4.1

Histogram of Overall Practice Scores Among Critical Care Nurse
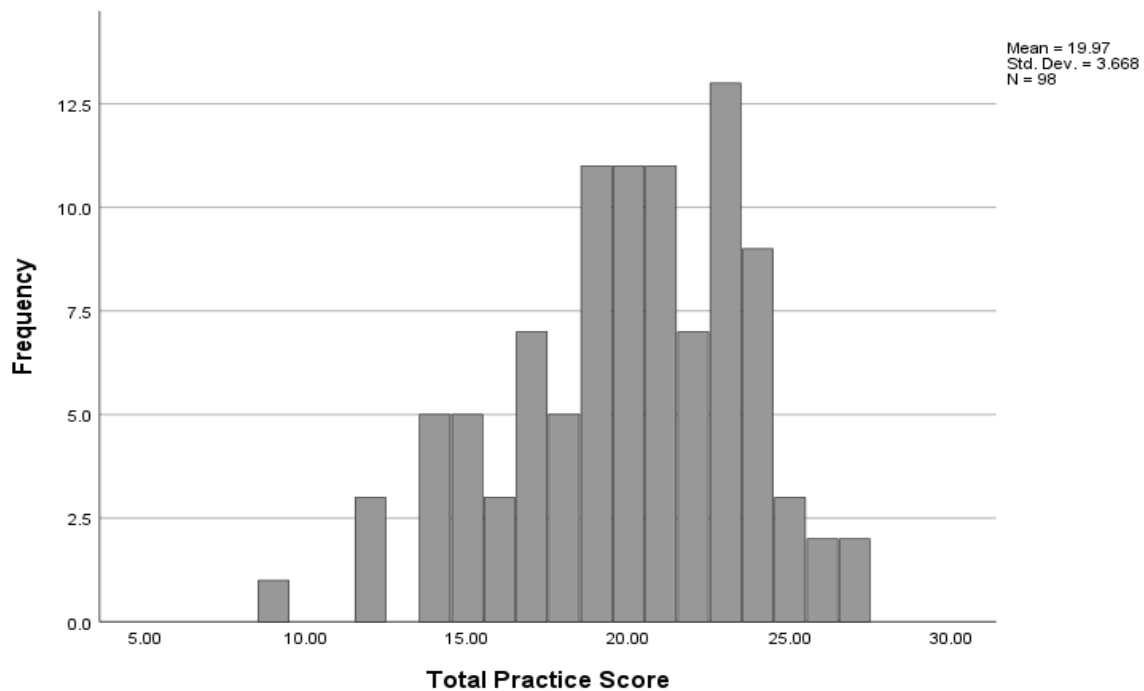
4.3.5 Knowledge of VTE

This section presents the findings related to participants' knowledge of VTE, as assessed through multiple-choice and true/false items in the questionnaire. The questions were designed to evaluate critical care nurses' understanding of VTE risk factors, clinical signs and symptoms, prevention strategies, and appropriate diagnostic measures. Participants were required to distinguish between predisposing and acquired risk factors, identify key signs of DVT and PE, and respond to a series of statements concerning best practices in VTE prevention and management. The responses provide insight into the strengths and potential gaps in clinical knowledge, which may impact the quality of VTE-related care delivered in critical care settings.

4.3.5.1 Knowledge of VTE risk factors

Participants were asked to classify a range of VTE risk factors as either predisposing/genetic or acquired/circumstantial. This item aimed to assess nurses' understanding of the underlying causes and contributing conditions associated with VTE, as accurate identification of these factors is crucial in clinical settings. The responses to this section reflect the participants' ability to distinguish between predisposing patient

characteristics and acquired contributors. The results help identify areas where knowledge may be strong or where additional educational reinforcement may be necessary.

Table 4.13 shows that participants demonstrated strong knowledge of common acquired VTE risk factors such as *hospitalisation*, *cancer therapy*, and *immobility*. However, their understanding was weaker for less common factors, including *nephrotic syndrome* and *varicose veins*. These results indicate strength in identifying familiar conditions, while highlighting gaps in recognising more complex or less common risk factors.

Table 4.13

Participant Accuracy in Classifying VTE Risk Factors

Risk factor	% Correct
Hospitalisation	86.7%
Family history of VTE	84.7%
History of smoking	84.7%
Cancer therapy	84.7%
Central venous catheterisation/pacemaker	84.7%
Acute medical illness	83.7%
Surgery	83.7%
Spinal cord injury	83.7%
Oestrogen-containing oral contraceptives	81.6%
Major trauma	81.6%
Immobility	82.7%
Obesity	76.5%
Thrombophilia	75.5%
Hormone replacement therapy	71.4%
Pregnancy/Postpartum period	69.4%
Cardiac or respiratory failure	58.2%
Inflammatory bowel disease	54.1%
Neurological disease with extremity paresis/paralysis	40.8%
Increasing age (>40 years)	35.7%
History of VTE	35.7%
Varicose Veins	34.7%
History of cancer	29.6%
Nephrotic syndrome	27.6%

To summarise participants' knowledge of VTE risk factors, a total score was calculated by summing the number of correctly classified items, with a maximum possible score of 23. As shown in Table 4.14, participants' scores ranged from 2 to 21. The results suggest a moderate

level of knowledge among participants, with notable variation. While some individuals demonstrated strong understanding, others showed limited recognition of both common and complex risk factors.

Table 4.14

Descriptive Statistics for Total Knowledge Score of VTE Risk Factors

Statistic	Value
Mean	15.02
Median	16
Std. Deviation	3.69
Minimum	2
Maximum	21

The distribution of total correct responses is illustrated in Figure 4.2. The histogram shows that the majority of participants correctly identified between 13 and 17 VTE risk factors.

Figure 4.2

Histogram of Total Knowledge Score of VTE Risk Factors
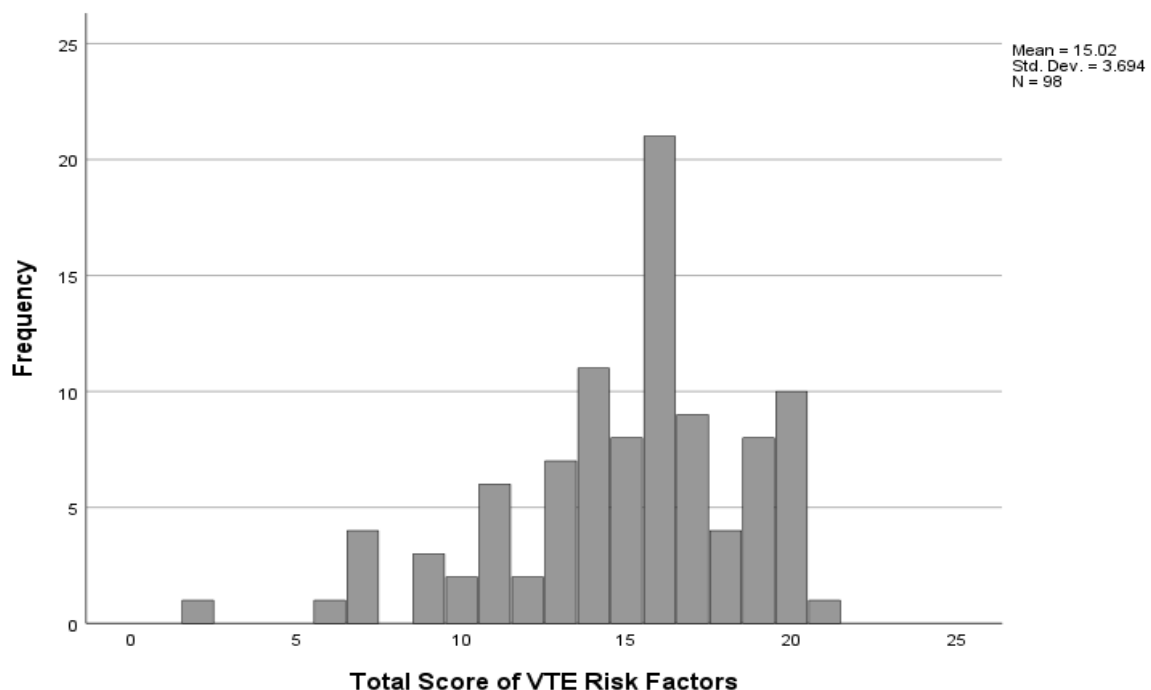
4.3.5.2 Knowledge of VTE signs and symptoms

Participants were asked to identify the signs and symptoms of DVT from a list of eight options. Most participants correctly identified the core clinical indicators, including *calf pain or tenderness* (94.9%), *swelling* (89.8%), and *warmth* (79.6%).

Notably, *pitting oedema*, selected by 28.6% of participants, was not considered a correct option in the context of this questionnaire, meaning these participants incorrectly identified it as a DVT-specific symptom. These findings, summarised in Table 4.15, suggest generally good recognition of key DVT symptoms, although some confusion remains around more ambiguous or less commonly discussed signs.

Table 4.15

Participant Knowledge of DVT Signs and Symptoms

Symptom	Frequency (n)	Percentage (%)
Calf pain, tenderness	93	94.9%
Swelling	88	89.8%
Warmth	78	79.6%
Erythema and discoloration	52	53.1%
Pitting oedema (incorrect)	28	28.6%
Cyanosis	27	27.6%
Dilated superficial veins	24	24.5%
Groin swelling	23	23.5%

To assess participants' overall knowledge of DVT symptoms, a total score was calculated based on the eight checklist items. One point was awarded for each correct symptom identified, and an additional point was given for not selecting the incorrect option (pitting oedema), resulting in a maximum possible score of 8. As shown in Table 4.16, scores ranged from 2 to 7, with a mean of 4.72 (SD = 1.42), indicating moderate knowledge. The median score of 5.00 suggests that at least half of the participants correctly identified five or more symptoms, although none achieved a full score.

Table 4.16

Descriptive Statistics for Total Knowledge Score of DVT Symptoms

Statistic	Value
Mean	4.72
Median	5
Std. Deviation	1.42
Minimum	2
Maximum	7

As presented in Figure 4.3, the most common scores were 4 (29.6%) and 5 (25.5%). Fewer participants scored at the lower end, with 8.2% achieving scores of 2 or 3, while 14.3% scored 6 or 7. Notably, no participant achieved the maximum possible score of 8, indicating that even those who identified all seven correct symptoms also selected the incorrect option. This pattern suggests that although general awareness of DVT symptoms was moderate, complete and accurate understanding was lacking across the sample, highlighting a potential area for targeted education.

Figure 4.3

Histogram of Total Knowledge Score of DVT Symptoms
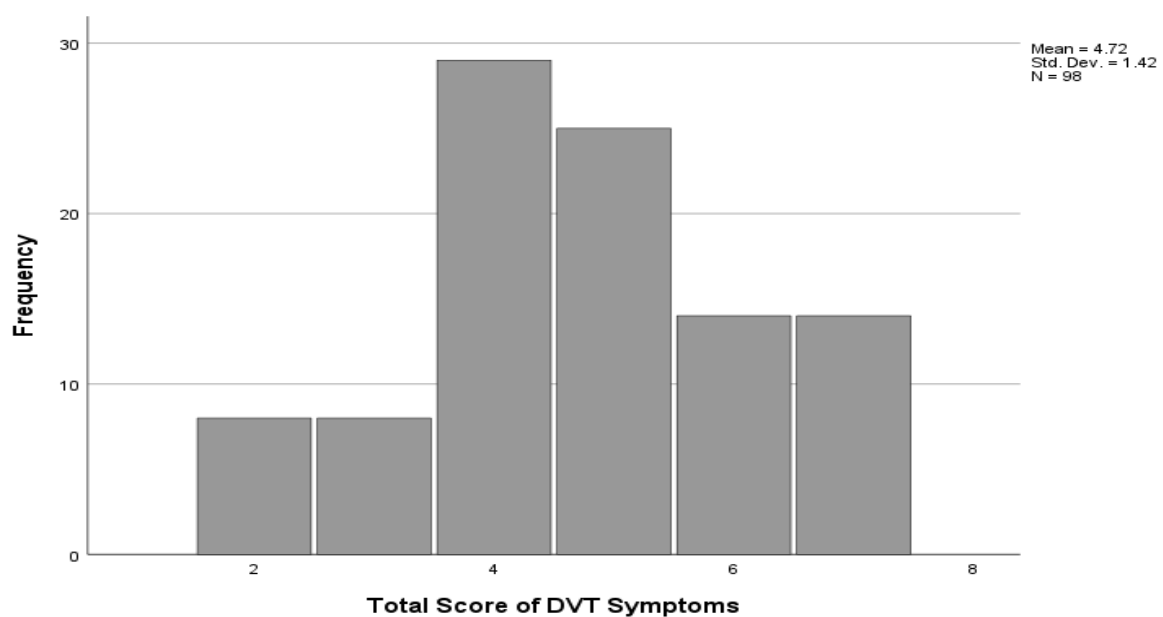
Following the assessment of DVT symptoms, participants were asked to identify the signs and symptoms of PE. The results indicated that *tachycardia* (86.6%) and *tachypnoea* (83.5%) were the most frequently recognised symptoms, aligning with their prominence in clinical guidelines for PE detection. *Dyspnoea* and *pleuritic or chest pain* were also commonly selected, reflecting moderate awareness of key respiratory symptoms.

Notably, *sudden collapse* (47.4%), a potentially critical sign of massive PE, was only recognised by less than half of the participants. These findings, as displayed in Table 4.17, suggest that while participants demonstrated a general understanding of primary PE symptoms, certain key signs, particularly those associated with severe or atypical presentations, were less consistently recognised, indicating areas for targeted educational reinforcement.

Table 4.17

Participant Knowledge of PE Signs and Symptoms

Symptom	Frequency (n)	Percentage (%)
Tachycardia	84	86.6%
Tachypnoea	81	83.5%
Dyspnoea	73	75.3%
Pleuritic or chest pain	68	70.1%
Sudden collapse	46	47.4%
Sweating	44	45.4%
Cyanosis	38	39.2%
Cough	30	30.9%
Haemoptysis	20	20.6%

To assess participants' overall knowledge of PE symptoms, a total score was computed by summing the number of correct responses selected from a list of nine symptoms. All nine were considered clinically valid indicators of PE. Thus, the maximum possible score was 9. As shown in Table 4.18, participants' PE symptom knowledge scores ranged from 0 to 9, with a mean of $M = 4.94$ ($SD = 1.90$), suggesting moderate knowledge but notable variation

among respondents. The median PE symptom knowledge score was 5.00, indicating that at least half of the participants correctly identified five or more symptoms.

Table 4.18

Descriptive Statistics for Total Knowledge Score of PE Symptoms

Statistic	Value
Mean	4.94
Median	5
Std. Deviation	1.90
Minimum	0
Maximum	9

As presented in Figure 4.4, the most common scores were 5 (20.4%) and 4 (17.3%), with only four participants (4.1%) identifying all nine symptoms correctly. Additionally, one participant (1.0%) failed to identify any correct symptoms, while nine participants (9.2%) selected only two correct options. Unlike the DVT symptom assessment, the PE section included only correct symptom options, so no points were deducted for selecting incorrect items.

These findings suggest that while participants were familiar with several common PE symptoms, only 4.1% achieved a full score, indicating that most were unable to recognise the full spectrum of PE indicators. This points to a need for further training in recognising less frequently emphasised symptoms of PE.

Figure 4.4

Histogram of Total Knowledge Score of PE Symptoms
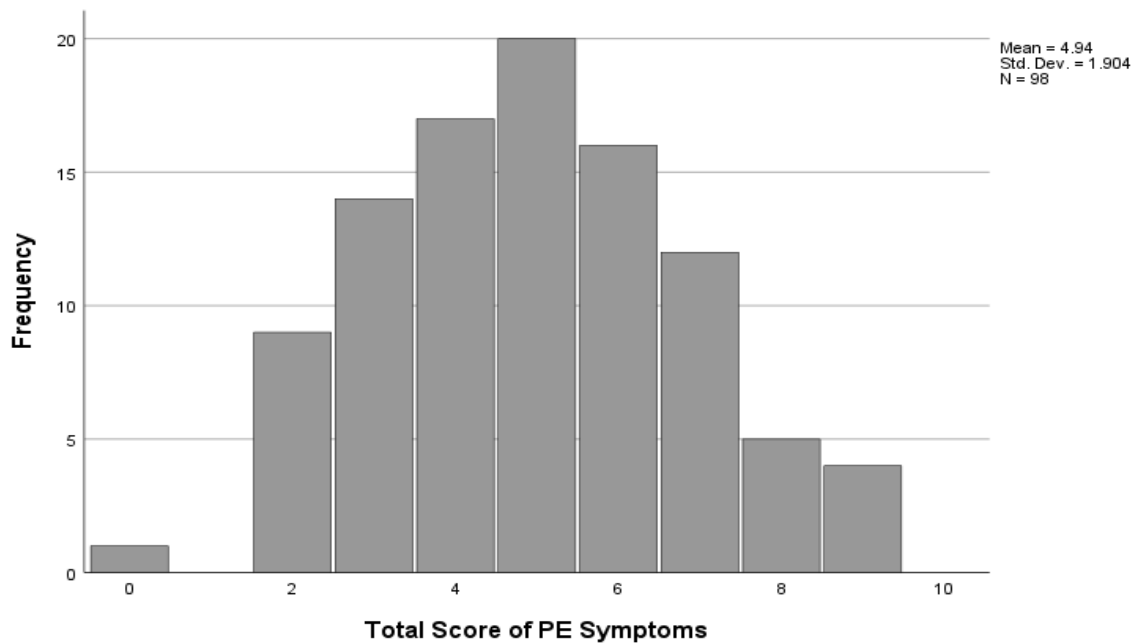
4.3.5.3   Knowledge of VTE Prevention and Management (True/False Section)

Participants were asked to determine the accuracy of 12 true or false statements related to VTE risk factors, prevention strategies, and management. This section aimed to assess participants' ability to apply evidence-based knowledge in clinical decision-making. As shown in Table 4.19, participants' VTE knowledge scores suggest moderate knowledge with notable variability in responses. While some participants demonstrated strong knowledge across most items, others showed inconsistent responses, reflecting gaps in their understanding and application of VTE prevention and management principles.

Table 4.19

Descriptive Statistics for Total Knowledge Score - True/False Section

Statistic	Value
Mean	7.57
Median	8
Std. Deviation	2.23
Minimum	2
Maximum	12

The results, presented in Figure 4.5, show that the most common scores were 8 (22.4%), 7 (17.3%), and 10 (13.3%). Only 4 participants (4.1%) correctly answered all 12 statements, while 3 participants (3.1%) identified only two correct statements.

Figure 4.5

Histogram of Total Knowledge Score - True/False Section
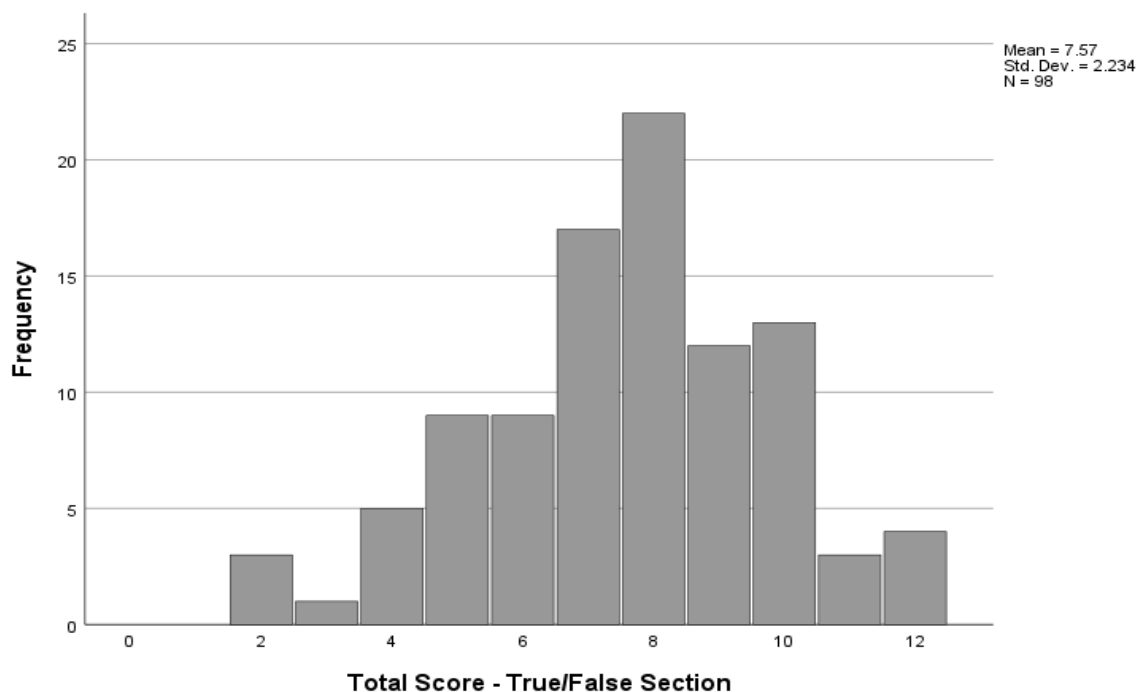
To provide further insight into specific knowledge areas, Table 4.20 presents an item-wise analysis of the proportion of participants who answered each of the 12 true/false statements correctly. Overall, accuracy levels varied notably across items. The highest accuracy was

observed in the item stating that enoxaparin has a lower risk of heparin-induced thrombocytopenia compared to heparin (10i), followed closely by the recognition that a young post-operative patient remains at risk for VTE (10g). In contrast, fewer than 40% of participants correctly answered questions regarding the appropriate use of mechanical prophylaxis (10b) and the Wells score for VTE risk assessment (10l). This indicates that although core pharmacological concepts are well understood, additional training may be required to strengthen knowledge of clinical assessment tools and non-pharmacological strategies for VTE prevention, which are very important aspects of nursing care.

Table 4.20

Item-wise Analysis of True/False VTE Knowledge Statements

	Correct Responses (%)	Mean	Std. Deviation
10a	69%	0.69	0.46
10b	37%	0.37	0.49
10c	73%	0.73	0.44
10d	59%	0.59	0.49
10e	74%	0.74	0.44
10f	57%	0.57	0.50
10g	79%	0.79	0.41
10h	51%	0.51	0.50
10i	83%	0.83	0.38
10j	74%	0.74	0.44
10k	61%	0.61	0.49
10l	39%	0.39	0.49

4.3.5.4   *Knowledge of Diagnostic Tests for VTE*

Participants were asked to identify the initial diagnostic test of choice for both DVT and PE. The purpose of this assessment was to evaluate their familiarity with evidence-based clinical guidelines regarding appropriate diagnostic procedures. For DVT, the majority of

participants (66.3%) correctly identified an ultrasound Doppler as the recommended diagnostic test, while 32.7% selected an incorrect option. These findings suggest that while most nurses in critical care settings are aware of the appropriate first-line investigation for DVT, a substantial proportion still lacks clarity regarding the preferred diagnostic approach.

Regarding PE diagnosis, only 41.8% of participants correctly identified a CT (Computed Tomography) scan as the appropriate initial diagnostic test, while 58.2% selected incorrect alternatives. This lower accuracy rate compared to the DVT question suggests greater uncertainty or misinformation regarding PE diagnosis. Although such investigations are ordered by physicians, a clear understanding of diagnostic pathways is essential for nurses to recognise clinical deterioration early, communicate effectively within the multidisciplinary team, and advocate for timely assessment. These findings highlight the importance of reinforcing interdisciplinary diagnostic knowledge within nursing education. The results are presented in Table 4.21.

Table 4.21

Participant Knowledge of Diagnostic Tests for VTE

Question	Correct Responses (n)	Correct Responses (%)
Q11: DVT Diagnosis	65	66.3%
Q12: PE diagnosis	41	41.8%

4.3.5.5 Overall Knowledge Score

The total knowledge score was computed by summing the number of correct responses across all knowledge-related items in the questionnaire. This included Question 7 (VTE risk factors classification), Question 8 (DVT symptoms), Question 9 (PE symptoms), Question 10 (True/False VTE-related knowledge items), Question 11 (initial diagnostic test for DVT), and Question 12 (initial diagnostic test for PE). Each correct response was awarded one point, with no penalties for incorrect answers, resulting in a total possible score of 54 points.

As presented in Table 4.22, the scores ranged from 14 to 47, with a mean score of 32.5 and a median of 33. The distribution of scores suggests moderate knowledge levels among participants, with some demonstrating stronger understanding, while others

exhibited noticeable gaps. The most frequently occurring score was 35, indicating that a significant proportion of participants clustered around this value. However, the wide range of scores suggests variability in participants' knowledge levels.

Table 4.22

Descriptive Statistics for Overall Knowledge Score

Statistic	Value
Mean	32.5
Median	33
Mode	35
Std. Deviation	5.62
Minimum	14
Maximum	47

Additionally, the distribution of total knowledge scores among participants is visually represented in Figure 4.6. The histogram illustrates a near-normal distribution, with the majority of participants scoring between 30 and 40.

Figure 4.6

Histogram of Total Knowledge Scores Among Critical Care Nurses
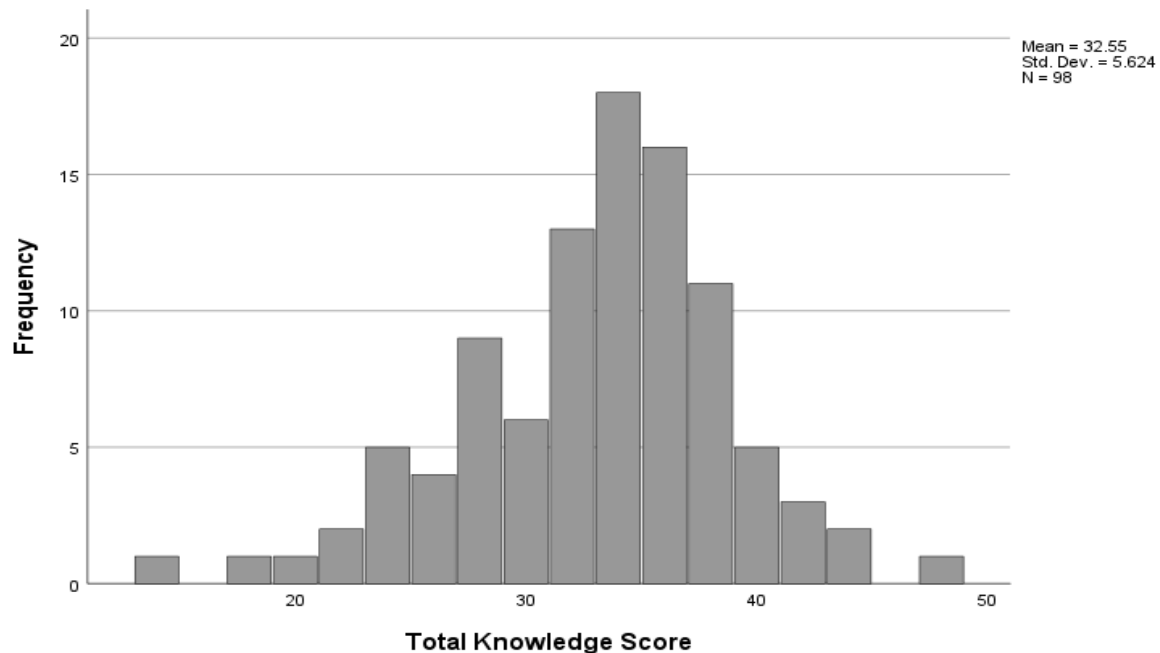
4.3.6 Self-Reported Assistance in Completing the Questionnaire

To assess whether participants sought external assistance while completing the questionnaire, nurses were asked if they had asked others for help or consulted external resources such as computers, mobile phones, or scientific journals. As presented in Table 4.23, 80.6% reported not seeking assistance from others, while 19.4% indicated that they did. Similarly, Table 4.24 shows that 85.7% of participants reported not using external resources, whereas 14.3% acknowledged doing so. While these findings suggest that most participants completed the questionnaire independently, such self-reported data may be subject to social desirability bias, as participants may underreport behaviours perceived as undesirable. Therefore, these results should be interpreted with caution. Since the majority of participants reported not seeking assistance, the survey can be considered an objective assessment of their knowledge and practices. The small proportion who sought help may indicate areas of uncertainty, highlighting topics that could benefit from further educational focus.

Table 4.23

Frequency of Participants Who Asked Others for Help

Response	Frequency (n)	Percentage (%)
No	79	80.6%
Yes	19	19.4%

Table 4.24

Frequency of Participants Who Looked Up the Answers

Response	Frequency (n)	Percentage (%)
No	84	85.7%
Yes	14	14.3%

4.4 Inferential Statistics: Comparative Analysis and Relationships

To evaluate the relationships between key variables, a range of non-parametric and categorical statistical tests were applied. These analyses focused on understanding how demographics, training, self-perceived knowledge, and reported barriers relate to overall knowledge and practice scores. Statistical significance was assessed at the 95% confidence level ($p < .05$). Results with p-values below this threshold led to the rejection of the null hypothesis (H_0), indicating a statistically significant association between variables. Conversely, p-values above .05 resulted in the retention of the H_0, suggesting no statistically significant relationship. Table 4.25 provides a summary of the statistical tests used throughout the analysis, highlighting the contexts in which each test was most appropriate based on the type and distribution of data.

Table 4.25

Overview of Statistical Tests and Their Applications

Statistical Test	Purpose	Application
Chi-Square Test	To assess associations between two categorical variables	Demographic variables vs. training attendance, self-rated knowledge, frequency of assessments, number of barriers
Mann–Whitney U Test	To compare two independent groups when the dependent variable is ordinal or continuous and not normally distributed	Overall practice/knowledge scores vs. gender, training attendance, self-reported assistance, individual barriers
Kruskal–Wallis H Test	To compare more than two independent groups when the dependent variable is not normally distributed	Overall practice/knowledge scores vs. demographic variables (excluding gender)
Kendall's Tau-b	To examine associations between ordinal or non-normally distributed continuous variables	Overall practice/knowledge scores vs. training quality, self-rated knowledge, frequency of VTE assessments AND Overall practice score vs. overall knowledge score

4.4.1 Comparing Attendance at VTE-Related Courses with Demographic Variables

This section explores whether previous attendance at VTE-related courses varies significantly across demographic groups. Since both the independent and dependent variables are categorical, normality testing was not required. A series of Chi-square tests of independence were therefore used for the following comparisons between demographic variables and other categorical outcomes to evaluate potential associations. Table 4.26 presents the Chi-square values, degrees of freedom (in parentheses), and corresponding p-values.

Hypotheses:

- *Null Hypothesis (H₀):* There is no significant association between attendance at VTE-related courses and demographic variables.

- *Alternative Hypothesis (H₁):* There is a significant association between attendance at VTE-related courses and demographic variables.

Table 4.26

Association between Attendance at VTE-Related Courses and Demographic Variables

Demographic Variable	χ² (df)	p-value	Decision (Null Hypothesis)	Significance
Age Group	4.493 (4)	.343	Not rejected	Not significant
Gender	.005 (1)	.942	Not rejected	Not significant
Highest level of nursing education completed	5.709 (2)	.058	Not rejected	Not significant
Total period of experience as a staff nurse	3.518 (3)	.318	Not rejected	Not significant
Current unit of work	5.252 (3)	.154	Not rejected	Not significant
Total period of experience in current unit	10.558 (4)	.032	Rejected	Significant
Country Where Nursing Education Was Completed	18.969 (2)	<.001	Rejected	Significant

Results:

Most demographic factors did not show a statistically significant association with attendance at VTE-related courses. However, two variables; the total period of experience in the current unit and the country where nursing education was completed, showed statistically significant associations. Therefore, the H_0 was rejected for these two factors.

4.4.2 Comparing Self-Rated Knowledge of VTE Risk Assessment with Demographic Variables

Hypotheses:

- *H_0:* There is no significant association between self-rated knowledge of VTE risk assessment and demographic variables.

- *H_1:* There is a significant association between self-rated knowledge of VTE risk assessment and demographic variables.

Table 4.27

Association between Self-Rated Knowledge of VTE Risk Assessment and Demographic Variables

Demographic Variable	χ² (df)	p-value	Decision (Null Hypothesis)	Significance
Age Group	26.864 (16)	.043	Rejected	Significant
Gender	2.526 (4)	.640	Not rejected	Not significant
Highest level of nursing education completed	12.995 (8)	.112	Not rejected	Not significant
Total period of experience as a staff nurse	12.996 (12)	.369	Not rejected	Not significant
Current unit of work	17.790 (12)	.122	Not rejected	Not significant
Total period of experience in current unit	16.974 (16)	.387	Not rejected	Not significant
Country Where Nursing Education Was Completed	7.878 (8)	.445	Not rejected	Not significant

Results:

Table 4.27 presents the results of the Chi-square tests indicating that among the demographic variables analysed, only "Age group" was significantly associated with self-rated knowledge of VTE risk assessment. This suggests that participants' age may influence how they rate their knowledge of VTE risk assessment. The other demographic variables were not significantly associated with self-rated knowledge. Therefore, the H_0 for these variables was not rejected.

4.4.3 Comparing Frequency of Performing VTE Risk Assessments with Demographic Variables

Hypotheses:

- *H_0:* There is no significant association between frequency of performing VTE risk assessments and demographic variables.

- *H_1:* There is a significant association between frequency of performing VTE risk assessments and demographic variables.

Table 4.28

Association between Frequency of Performing VTE Risk Assessments and Demographic Variables

Demographic Variable	χ² (df)	p-value	Decision (Null Hypothesis)	Significance
Age Group	16.330 (16)	.430	Not rejected	Not significant
Gender	**11.846 (4)**	**.019**	**Rejected**	**Significant**
Highest level of nursing education completed	7.698 (8)	.464	Not rejected	Not significant
Total period of experience as a staff nurse	8.154 (12)	.773	Not rejected	Not significant
Current unit of work	**22.573 (12)**	**.032**	**Rejected**	**Significant**
Total period of experience in current unit	16.061 (16)	.449	Not rejected	Not significant
Country Where Nursing Education Was Completed	**21.809 (8)**	**.005**	**Rejected**	**Significant**

Results:

As presented in Table 4.28, most demographic factors were not significantly associated with the frequency of performing VTE risk assessments, resulting in the retention of the H_0. However, "Gender," "Current Unit of Work," and "Country of Nursing Education" showed statistically significant associations, suggesting that these variables may influence how frequently nurses perform VTE risk assessments.

4.4.4 Comparing Barriers to Performing VTE Risk Assessments with Demographic Variables

Hypotheses:

- *H_0:* There is no significant association between the number of barriers encountered and demographic variables.

- *H_1:* There is a significant association between the number of barriers encountered and demographic variables.

Table 4.29

Association between the Number of Barriers Encountered and Demographic Variables

Demographic Variable	χ^2 (df)	p-value	Decision (Null Hypothesis)	Significance
Age Group	26.237 (20)	.158	Not rejected	Not significant
Gender	6.509 (5)	.260	Not rejected	Not significant
Highest level of nursing education completed	15.154 (10)	.127	Not rejected	Not significant
Total period of experience as a staff nurse	**36.228 (15)**	**.002**	**Rejected**	**Significant**
Current unit of work	24.057 (15)	.064	Not rejected	Not significant
Total period of experience in current unit	23.539 (20)	.263	Not rejected	Not significant
Country Where Nursing Education Was Completed	7.288 (10)	.698	Not rejected	Not significant

Results:

As presented in Table 4.29, most demographic factors did not show a statistically significant association with the number of barriers, leading to the retention of the H_0. However, a statistically significant association was found between total nursing experience and the number of reported barriers (p = .002). To further explore this relationship, descriptive statistics were calculated (see Table 4.30), which revealed that nurses with less experience reported a higher mean number of barriers, while those with more than 10 years of experience reported the fewest.

Table 4.30

Mean Number of Barriers Reported by Total Nursing Experience

Experience Level	Mean Number of Barriers
1–3 years	3.00
4–6 years	2.70
7–10 years	2.04
>10 years	1.85

4.4.5   Comparing the Overall Practice Score with Demographics Variables

To assess whether the total practice scores followed a normal distribution, the Shapiro-Wilk test was conducted, as it is more appropriate for small to medium sample sizes (Field, 2018). The total practice score had a Shapiro-Wilk statistic of .971, p = .028, which is statistically significant (p < .05), indicating that the practice scores deviated from normality. This suggests that non-parametric statistical tests may be more appropriate for analyses involving the total practice score. The Mann-Whitney U test was used for comparisons involving two independent groups, while the Kruskal-Wallis H test was employed for variables with more than two categories. These tests were used to explore whether overall practice scores differed significantly across demographic categories.

4.4.5.1 Association between the Overall Practice Score and Age Groups

Hypotheses:

- *H₀:* There is no significant difference in overall practice scores across age groups.

- *H₁:* There is a significant difference in overall practice scores across age groups.

Results:

A Kruskal-Wallis H test was conducted to determine whether overall practice scores differed significantly across the five age groups. The test yielded no statistically significant result (χ^2(4, N = 98) = 1.284, p = .864), indicating that age group was not significantly associated with self-reported VTE-related practice scores. As shown in Figure 4.7, practice score distributions were comparable across groups, with no notable differences in median values.

Figure 4.7

Distribution of Overall Practice Scores by Age Group (Boxplot)
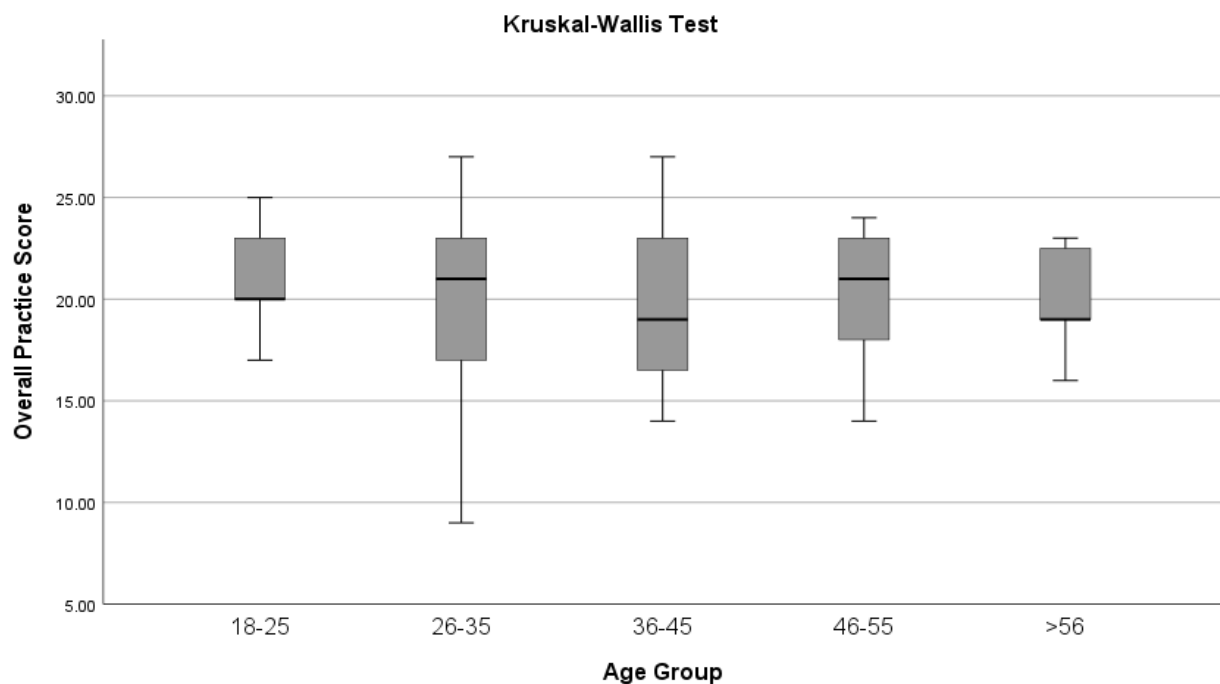
4.4.5.2 Association between the Overall Practice Score and Gender

Hypotheses:

- *H₀:* There is no significant difference in overall practice scores between male and female participants.

- *H₁:* There is a significant difference in overall practice scores between male and female participants.

Results:

A Mann-Whitney U test revealed no statistically significant difference in self-reported practice scores between male and female nurses (U = 1021.50, Z = -0.87, p = .386). Although females had a slightly higher mean rank (M = 51.48) than males (M = 46.38), this difference was not significant. As shown in Figure 4.8, the boxplot reflects this trend, with female nurses displaying marginally higher median scores and greater variability, consistent with the statistical findings.

Figure 4.8

Distribution of Overall Practice Scores by Gender (Boxplot)
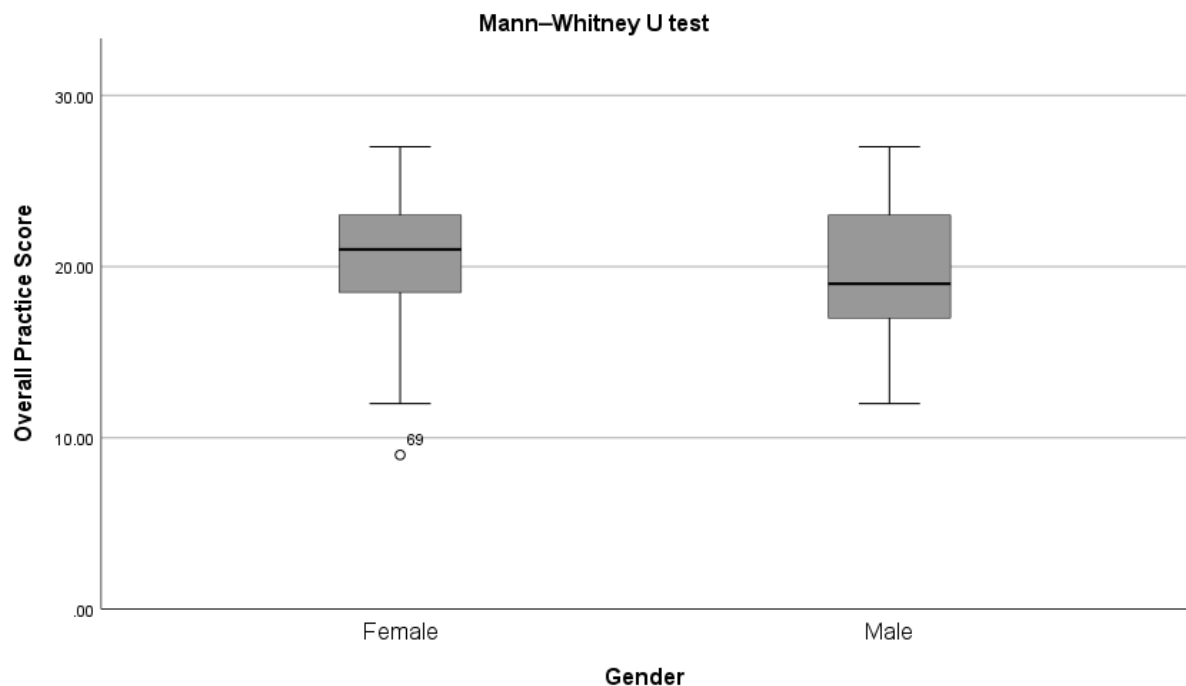
4.4.5.3 Association between the Overall Practice Score and Highest Level of Education

Hypotheses:

- *H_0:* There is no significant difference in overall practice scores across levels of education.

- *H_1:* There is a significant difference in overall practice scores across levels of education.

Results:

A Kruskal-Wallis H test showed no statistically significant difference in the overall practice scores across education levels ($\chi^2(2, N = 98) = 1.328$, $p = .515$). As a result, the H_0 was accepted, indicating that participants' highest level of nursing education was not associated with their practice scores. This distribution is illustrated in Figure 4.9.

Figure 4.9

Distribution of Overall Practice Scores by Highest Level of Education (Boxplot)
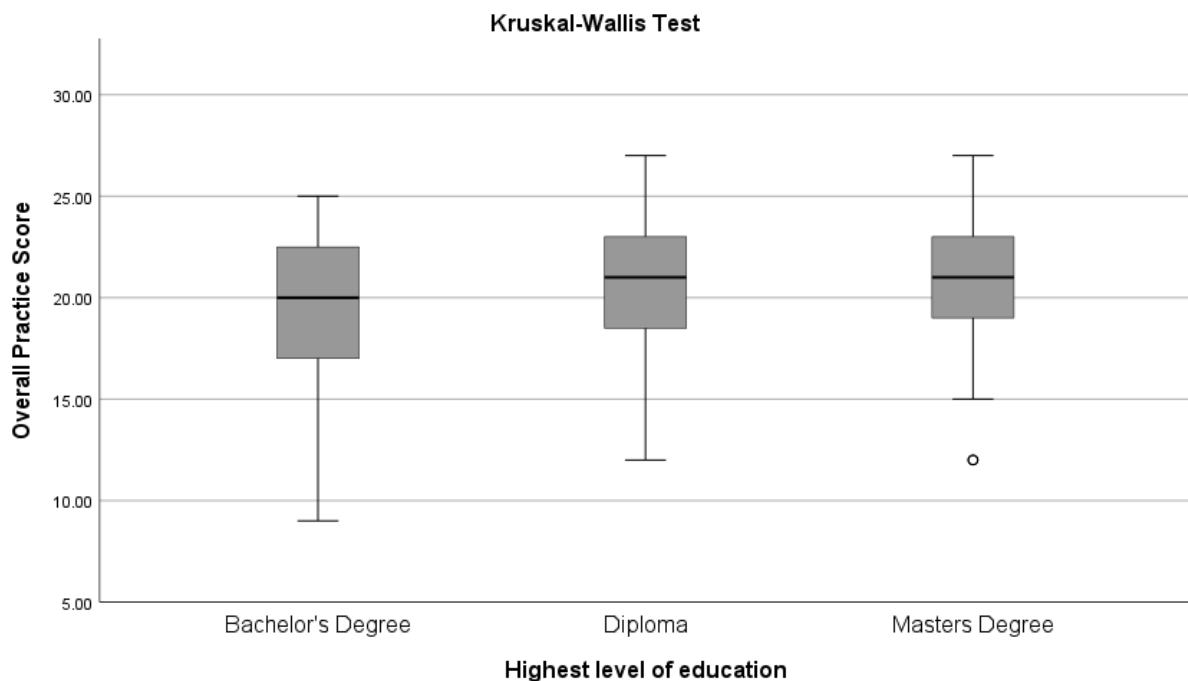
4.4.5.4   Association between the Overall Practice Score and Total Period of Experience as a Nurse

Hypotheses:

- *Ho:* There is no significant difference in overall practice scores across different levels of total nursing experience.

- *H1:* There is a significant difference in overall practice scores across different levels of total nursing experience.

Results:

As shown in Figure 4.10, the distribution of overall practice scores across the different experience categories appears relatively similar, with no pronounced differences in median values. Although there is some variability, particularly in the 7–10 years group which exhibited a wider range and some outliers, these visual differences were not statistically significant, as supported by the Kruskal-Wallis test results ($\chi^2(3, N = 98) = 2.081$, *p* = .556). This therefore suggests that participants' total experience as nurses was not significantly associated with their VTE-related practice scores.

Figure 4.10

Distribution of Overall Practice Scores by Total Period of Experience as a Nurse (Boxplot)
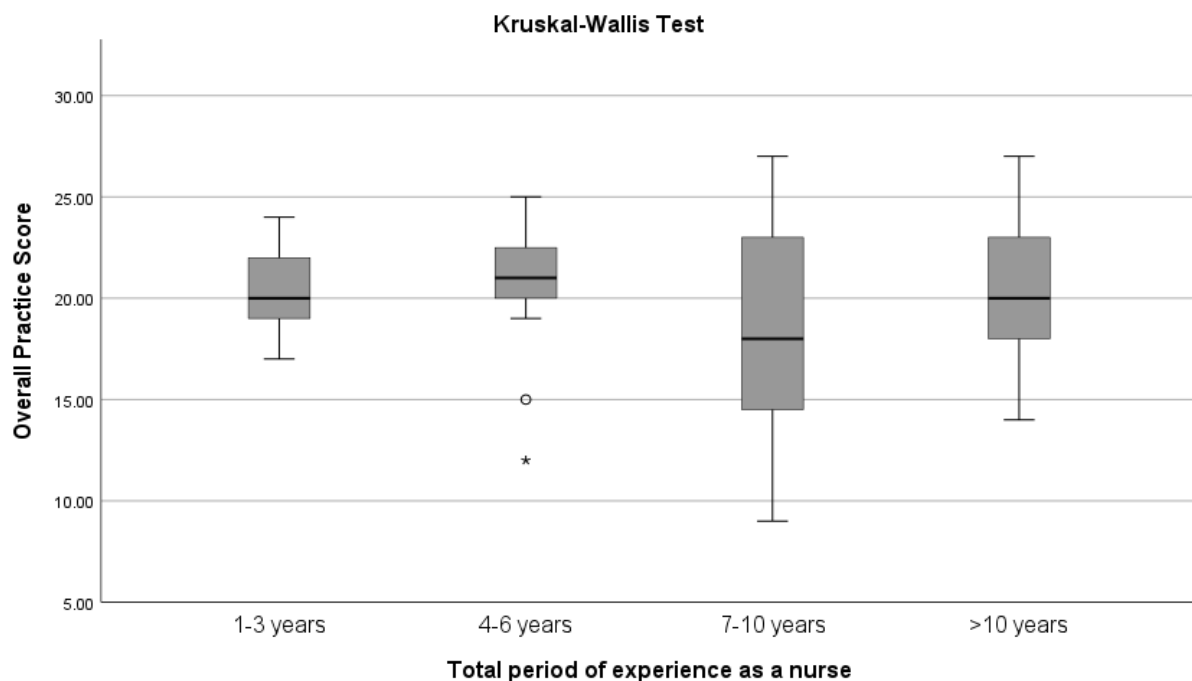
4.4.5.5   *Association between the Overall Practice Score and Current Unit of Work*

Hypotheses:

- *H₀:* There is no significant difference in overall practice scores across the current unit of work.
- *H₁:* There is a significant difference in overall practice scores across the current unit of work.

Results:

A Kruskal-Wallis H test revealed no statistically significant difference in overall practice scores across current units of work ($\chi^2(3, N = 98) = 6.100$, $p = .107$). Therefore, the H₀ was not rejected, indicating that unit of work did not significantly influence VTE-related practice scores. As shown in Figure 4.11, median scores were slightly higher among those working in the CCCU and ITU, but overall distribution remained similar across groups.

Figure 4.11

Distribution of Overall Practice Scores by Current Unit of Work (Boxplot)
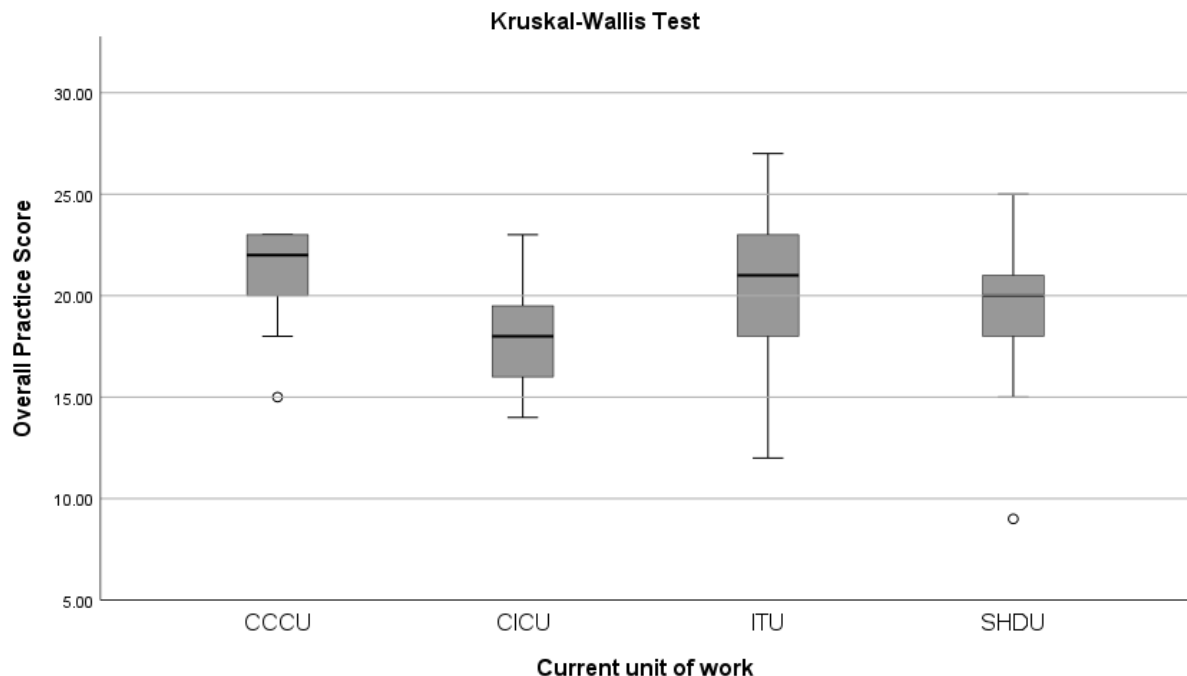
4.4.5.6 Association between the Overall Practice Score and Total Experience in Current Unit

Hypotheses:

- *H₀:* There is no significant difference in overall practice scores across categories of total experience in the current unit.

- *H₁:* There is a significant difference in overall practice scores across categories of total experience in the current unit.

Results:

A Kruskal-Wallis H test revealed no statistically significant differences across the five experience categories ($\chi^2(4, N = 98) = 1.800$, $p = .773$). Therefore, the H_0 was accepted, suggesting that the length of time nurses had worked in their current unit was not significantly associated with their VTE practice scores. As illustrated in Figure 4.12, the median practice scores were similar across all experience groups, with slight variations in score distribution. However, these differences were not statistically significant.

Figure 4.12

Distribution of Overall Practice Scores by Total Experience in Current Unit (Boxplot)
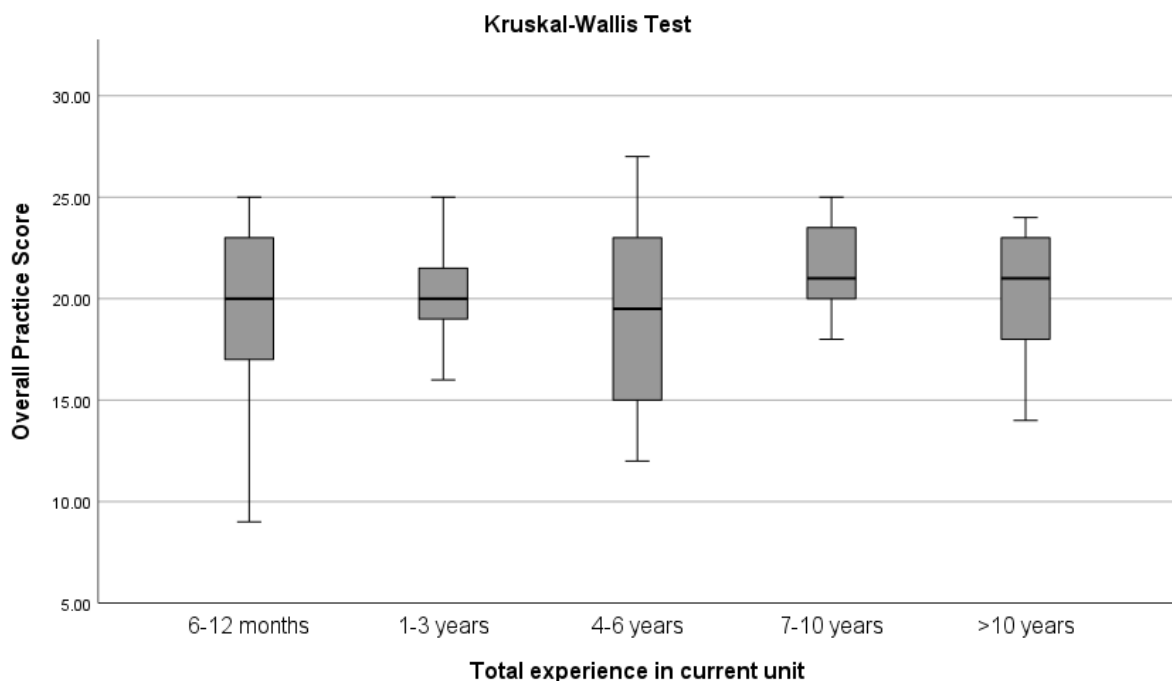
Hypotheses:

- *H₀:* There is no significant difference in overall practice scores across groups based on country of nursing education completion.

- *H₁:* There is a significant difference in overall practice scores across groups based on country of nursing education completion.

Results:

A Kruskal-Wallis H test found no statistically significant difference in overall practice scores based on the country where participants completed their nursing education ($\chi^2(2, N = 98) = 0.191$, $p = .909$). This suggests that the country of qualification did not significantly influence VTE-related practice scores. As shown in Figure 4.13, score distributions appeared similar across groups, with the "Another EU Country" group showing limited variability due to its small sample size ($n = 5$). Overall, the data supports the absence of meaningful differences between the groups.

Figure 4.13

Distribution of Overall Practice Scores by Country of Nursing Education Completion (Boxplot)
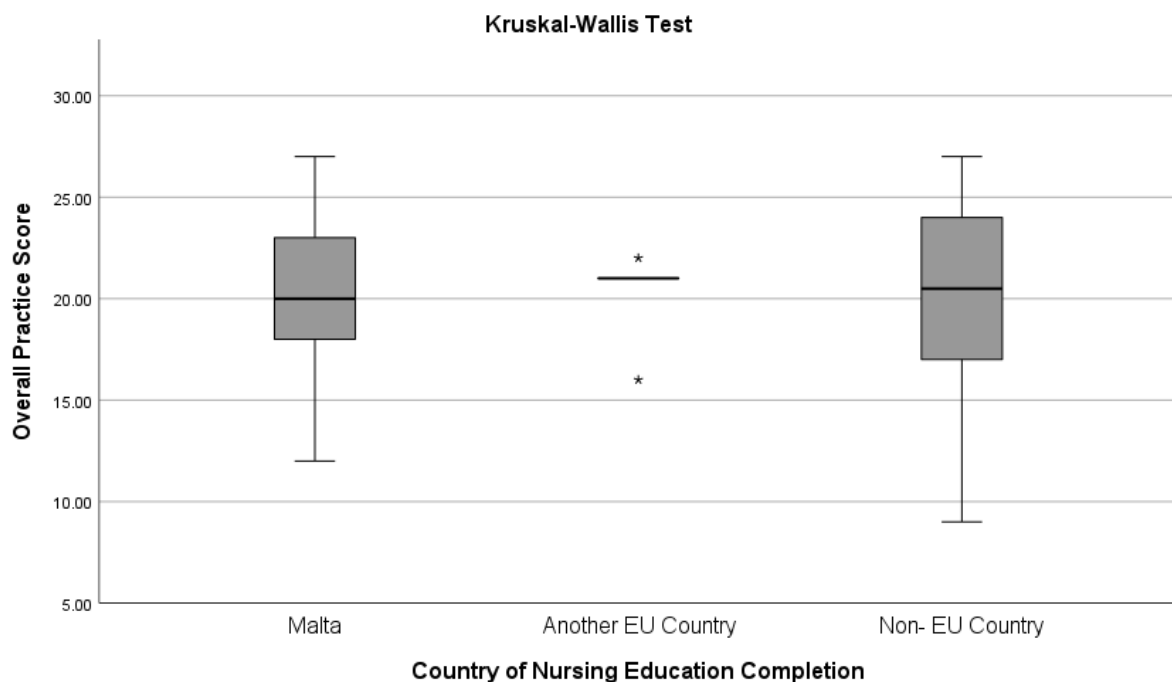
4.4.6 Comparing the Overall Knowledge Score with Demographics Variables

The Shapiro-Wilk test was again used to assess the normality of the total knowledge score. The result was not statistically significant ($W(98) = 0.976$, $p = .065$), indicating that the distribution did not significantly deviate from normality. However, given the proximity of the p-value to the .05 threshold and to maintain consistency with the analyses conducted for the practice score, which was not normally distributed, the same non-parametric tests were used for subsequent comparisons. This ensures methodological consistency.

4.4.6.1 Association between the Overall Knowledge Score and Age Groups

Hypotheses:

- H_0: There is no significant difference in overall knowledge scores across age groups.

- H_1: There is a significant difference in overall knowledge scores across age groups.

Results:

A Kruskal-Wallis H test showed no statistically significant difference ($\chi^2(4, N = 98) = 0.557$, $p = .968$), indicating that age group was not significantly associated with participants' overall VTE-related knowledge scores. As illustrated in Figure 4.14, score distributions were relatively consistent across age categories, with no clear pattern suggesting meaningful variation.

Figure 4.14

Distribution of Overall Knowledge Scores by Age Groups (Boxplot)

Kruskal-Wallis Test
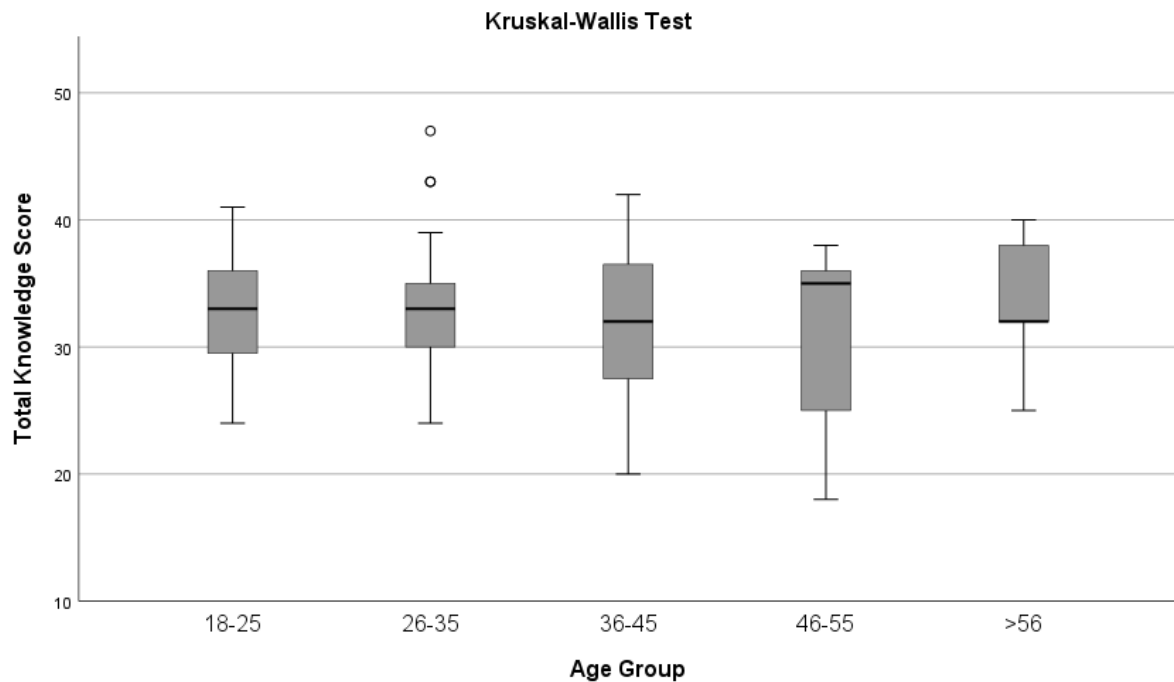
### *4.4.6.2   Association between the Overall Knowledge Score and Gender*

Hypotheses:

- *H₀:* There is no significant difference in overall knowledge scores between male and female nurses.

- *H₁:* There is a significant difference in overall knowledge scores between male and female nurses.

Results:

A Mann-Whitney U test found no statistically significant difference in knowledge scores between male and female participants (U = 954.50, Z = -1.36, p = .175), indicating that gender was not significantly associated with overall knowledge scores. As shown in Figure 4.15, female participants had a slightly higher median and mean rank (M = 52.59) compared to males (M = 44.62), but these differences were not statistically significant.

Figure 4.15

Distribution of Overall Knowledge Scores by Gender (Boxplot)
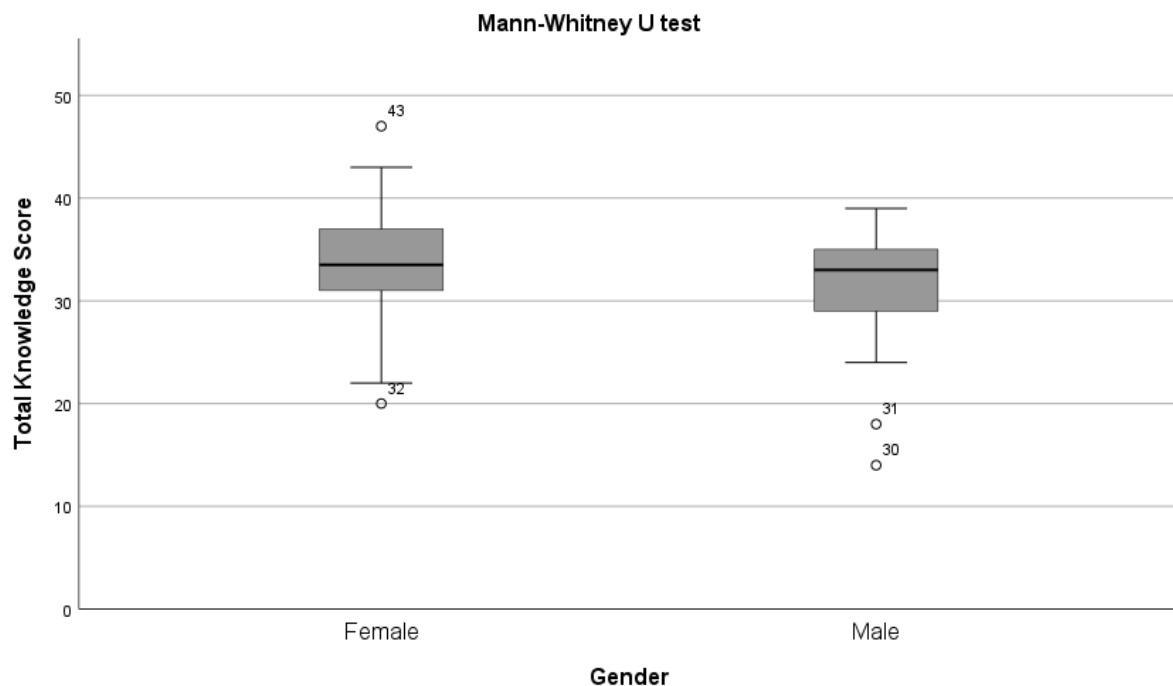
4.4.6.3   *Association between the Overall Knowledge Score and Highest Level of Education*

Hypotheses:

- H_0: There is no significant difference in overall knowledge scores across different levels of education.

- H_1: There is a significant difference in overall knowledge scores across different levels of education.

Results:

A Kruskal-Wallis H test revealed no statistically significant difference in overall knowledge scores across the three educational groups (χ^2(2, N = 98) = 0.671, p = .715). Thus, the H_0 was not rejected, suggesting that level of education was not significantly associated with VTE-related knowledge scores. As illustrated in Figure 4.16, the distribution of scores appeared comparable across groups, with no clear differences in medians or variability.

Figure 4.16

Distribution of Overall Knowledge Scores by Highest Level of Education (Boxplot)
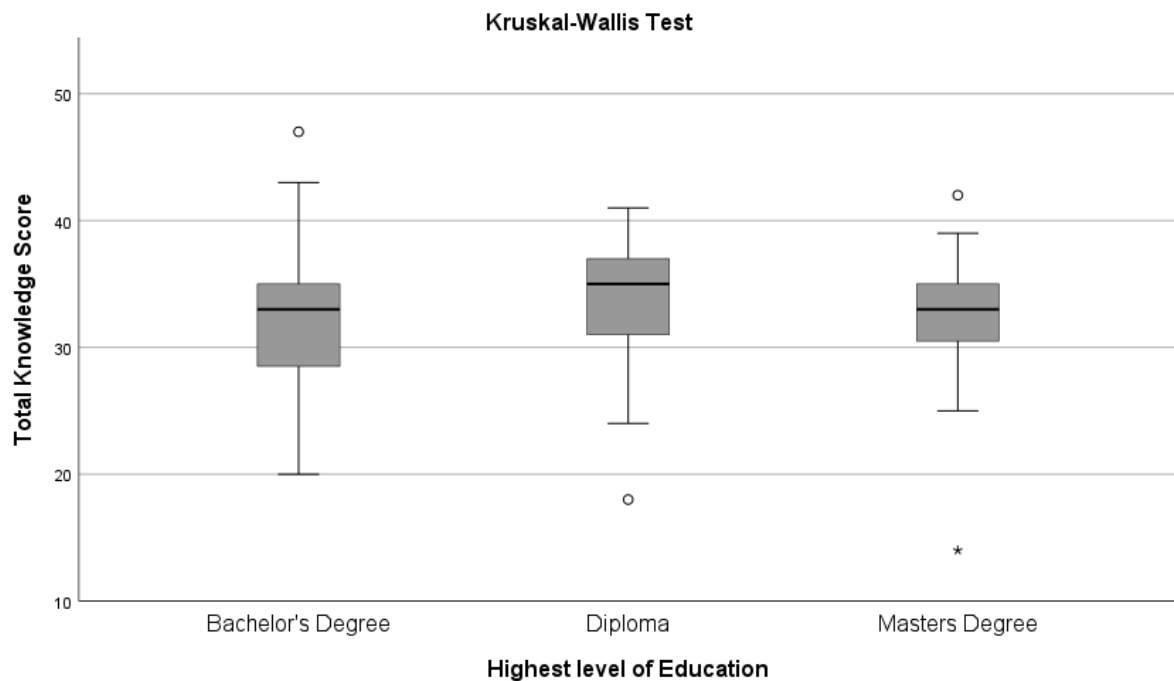
***4.4.6.4***   ***Association between the Overall Knowledge Score and Total Period of Experience as a Nurse***

Hypotheses:

- *H₀:* There is no significant difference in total knowledge scores across groups based on total period of experience as a nurse.

- *H₁:* There is a significant difference in total knowledge scores across groups based on total period of experience as a nurse.

Results:

A Kruskal-Wallis H test found no statistically significant difference in overall knowledge scores across nursing experience groups (χ^2(3, N = 98) = 1.337, p = .720), suggesting that total years of nursing experience were not significantly associated with participants' VTE-related knowledge. As shown in Figure 4.17, score distributions were generally consistent across groups, with minor variation and a few low outliers in the >10 years category.

Figure 4.17

Distribution of Overall Knowledge Scores by Total Period of Experience as a Nurse (Boxplot)
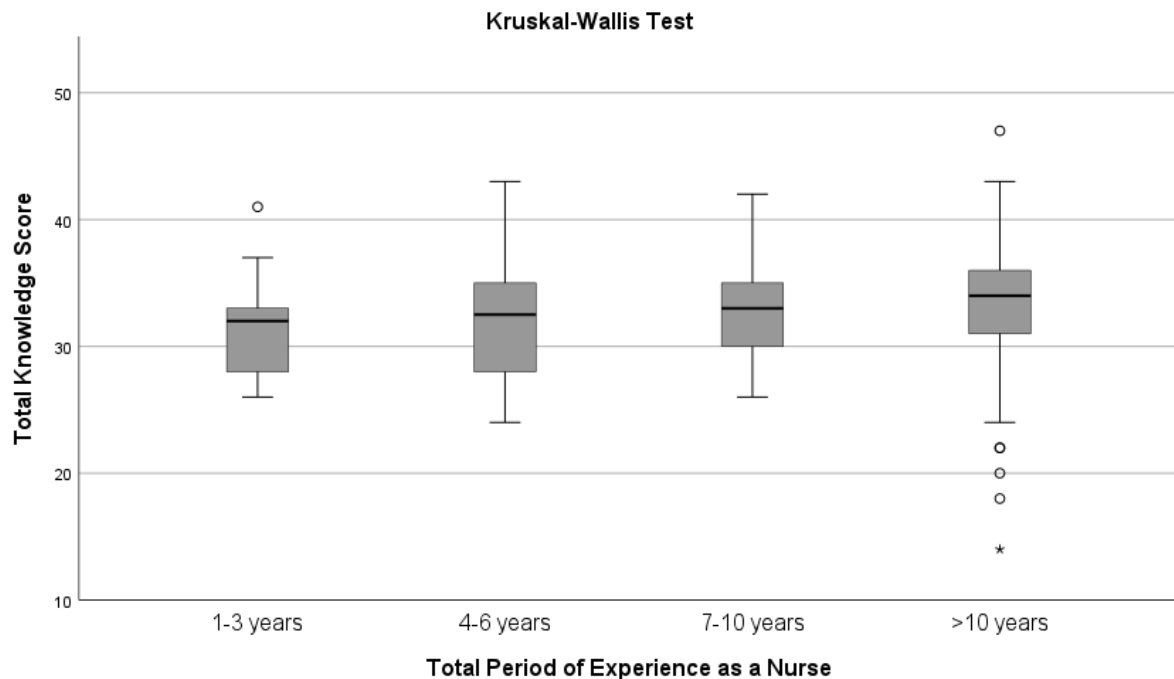
4.4.6.5 Association between the Overall Knowledge Score and Current Unit of Work

Hypotheses:

- H_0: There is no significant difference in overall knowledge scores across different current units of work.

- H_1: There is a significant difference in overall knowledge scores across different current units of work.

Results:

A Kruskal-Wallis H test showed no statistically significant difference in knowledge scores across the four work units (χ^2(3, N = 98) = 0.761, p = .859). Thus, the H_0 was accepted, indicating that participants' current unit of work was not significantly associated with their VTE-related knowledge. As shown in Figure 4.18, the distribution of scores was relatively consistent across units, supporting the statistical finding of no meaningful difference.

Figure 4.18

Distribution of Overall Knowledge Scores by Current Unit of Work (Boxplot)
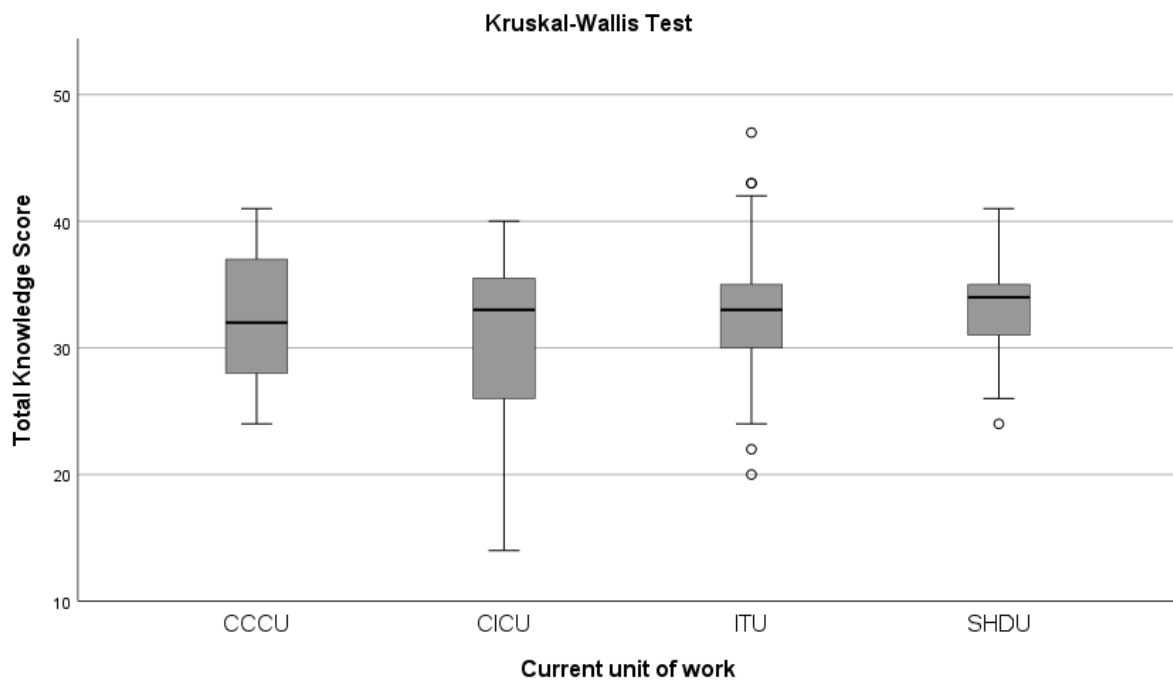
4.4.6.6 Association between the Overall Knowledge Score and Total Experience in Current Unit

Hypotheses:

- *H₀:* There is no significant difference in overall knowledge scores across groups based on total experience in the current unit.

- *H₁:* There is a significant difference in overall knowledge scores across groups based on total experience in the current unit.

Results:

A Kruskal-Wallis H test revealed no statistically significant differences in overall knowledge scores among the five experience groups ($\chi^2(4, N = 98) = 7.868$, $p = .097$), indicating that length of experience in the current unit was not significantly associated with overall VTE-related knowledge. As illustrated in Figure 4.19, the distribution of scores was generally consistent across groups, with no group demonstrating distinctly higher or lower medians. Although some variability was observed, the differences were not statistically meaningful.

Figure 4.19

Distribution of Overall Knowledge Scores by Total Experience in Current Unit (Boxplot)
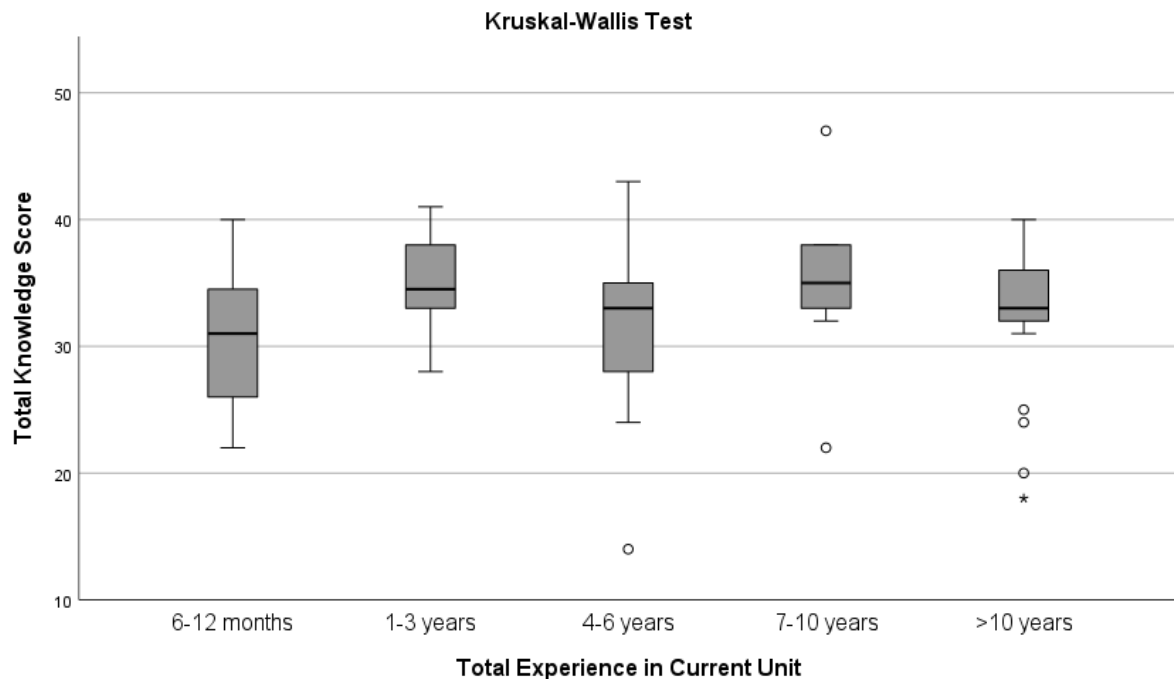
4.4.6.7 *Association between the Overall Knowledge Score and Country of Nursing Education Completion*

Hypotheses:

- *H₀:* There is no significant difference in overall knowledge scores across countries of nursing education completion.

- *H₁:* There is a significant difference in overall knowledge scores across countries of nursing education completion.

Results:

A Kruskal-Wallis H test showed no statistically significant difference in overall knowledge scores based on the country where participants completed their nursing education ($\chi^2(2, N = 98) = 0.563$, $p = .755$), indicating no significant association between this variable and overall knowledge. As illustrated in Figure 4.20, the distribution appeared similar across all three groups. Although the "Another EU Country" group showed a limited range due to a small sample size (n = 5), no notable differences were observed.

Figure 4.20

Distribution of Overall Knowledge Scores by Country of Nursing Education Completion (Boxplot)
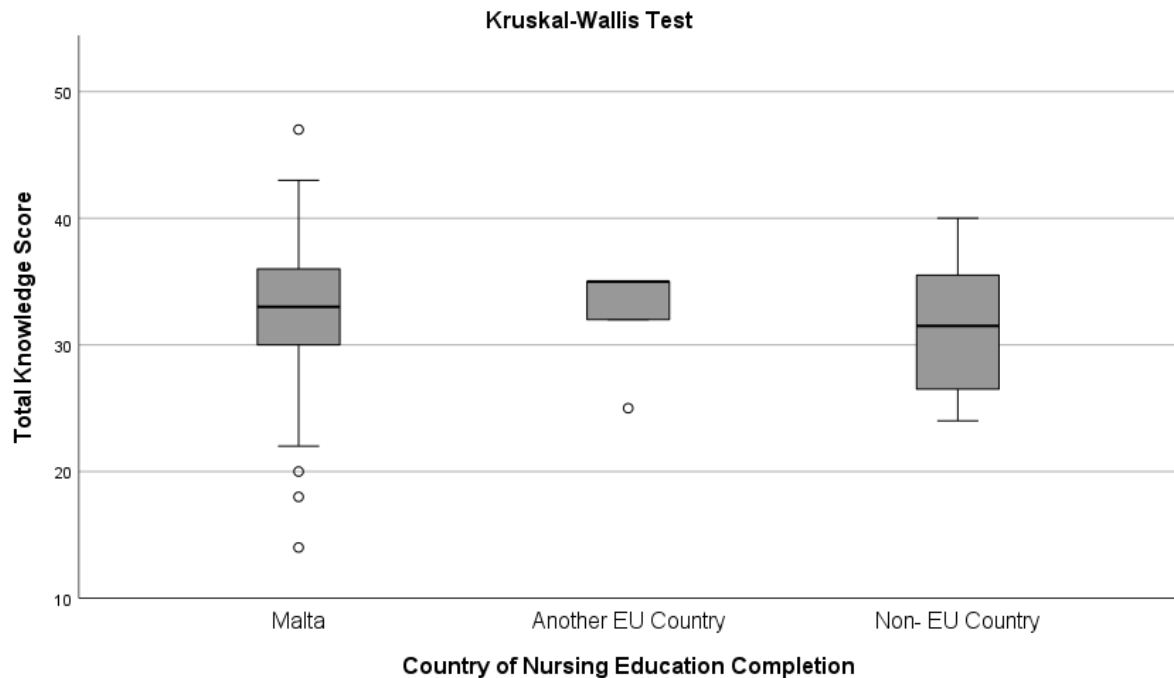
4.4.7 Comparing the Overall Practice Score with VTE Training and Perceived Knowledge

Since the following comparisons involve categorical variables and a continuous non-normally distributed variable (overall practice score), testing for normality is not applicable in this context. As previously established, the overall practice score did not meet normality assumptions. Therefore, non-parametric tests were employed for these analyses. Specifically, the Mann-Whitney U test was used when comparing two independent groups and Kendall's Tau-b correlation was used to assess the relationship between ordinal variables and continuous scores.

4.4.7.1 Association between the Overall Practice Score and Attendance at VTE-Related Courses

Hypotheses:

- *H_0:* There is no significant difference in overall practice scores between those who attended VTE-related courses and those who did not.

- *H₁:* There is a significant difference in overall practice scores between those who attended VTE-related courses and those who did not.

Results:

A Mann-Whitney U test revealed no statistically significant difference in total practice scores between participants who attended VTE-related courses and those who did not ($U = 952.5$, $p = .211$). As shown in Figure 4.21, the median score was slightly higher among attendees, but this difference was not significant, and the H₀ was not rejected. This suggests that course attendance was not associated with variations in overall practice scores.

Figure 4.21

Distribution of Overall Practice Score by Attendance at VTE-Related Courses (Boxplot)
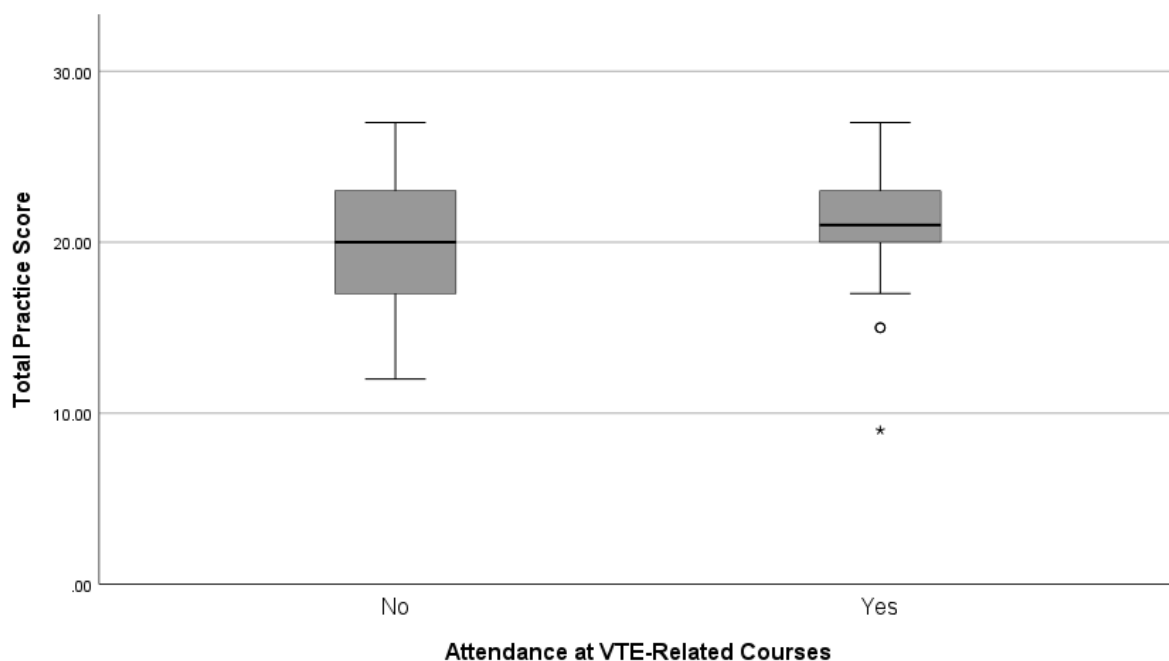
4.4.7.2   *Association between the Overall Practice Score and Self-Rated Quality of VTE-Related Courses*

Hypotheses:

- *H₀:* There is no significant correlation between the overall practice score and the perceived quality of VTE-related courses.

- *H₁:* There is a significant correlation between the overall practice score and the perceived quality of VTE-related courses.

Table 4.31

Kendall's tau-b Correlation between Overall Practice Score and Self-Rated Quality of VTE-Related Courses

Variables	Kendall's tau-b	p-value
Overall practice score vs. Self-rated quality of VTE-related courses	0.113	.535

Results:

A Kendall's tau-b correlation was conducted to assess the relationship between overall practice scores and self-rated quality of VTE-related courses, as presented in Table 4.31. The analysis revealed no significant correlation, indicating that perceived course quality was not associated with variations in practice scores. As a result, the H_0 was not rejected.

4.4.7.3 Association between the Overall Practice Score and Self-Rated Knowledge of VTE Risk Assessment

Hypotheses:

- *H_0:* There is no significant correlation between the overall practice score and self-rated knowledge of VTE risk assessment.

- *H_1:* There is a significant correlation between the overall practice score and self-rated knowledge of VTE risk assessment.

Table 4.32

Kendall's tau-b Correlation between Overall Practice Score and Self-Rated Knowledge of VTE Risk Assessment

Variables	Kendall's tau-b	p-value
Overall practice score vs. Self-rated knowledge of VTE risk assessment	**0.365**	**< .001**

Results:

A Kendall's tau-b correlation, displayed in Table 4.32, revealed a statistically significant positive correlation between self-rated knowledge of VTE risk assessment and overall

practice scores. This indicates that participants who rated their knowledge higher tended to report better practice scores.

4.4.8 Comparing Overall Practice Score with Practices Related to VTE

Since the comparisons involve ordinal variables and a continuous non-normally distributed variable (overall practice score), normality testing is not required. Non-parametric methods, including the Mann-Whitney U test for two-group comparisons and Kendall's Tau-b for correlations, were used to analyse the data.

4.4.8.1 *Association between the Overall Practice Score and Frequency of Performing VTE Risk Assessments*

Hypotheses:

- H_0: There is no significant correlation between the overall practice score and the frequency of performing VTE risk assessments.

- H_1: There is a significant correlation between the overall practice score and the frequency of performing VTE risk assessments.

Table 4.33

Kendall's tau-b Correlation between Overall Practice Score and Frequency of Performing VTE Risk Assessments

Variables	Kendall's tau-b	p-value
Overall practice score vs. Frequency of performing VTE risk assessment	**0.371**	**< .001**

Results:

As shown in Table 4.33, a Kendall's Tau-b correlation revealed a statistically significant positive association between the frequency of performing VTE risk assessments and overall practice scores. This indicates that a higher frequency of performing VTE risk assessments was associated with higher practice scores.

4.4.8.2 Association between the Overall Practice Score and Barriers to Performing VTE Risk Assessments

Hypotheses:

- H_0: There is no significant difference in the distribution of overall practice scores between participants who reported the barrier and those who did not.

- H_1: There is a significant difference in the distribution of overall practice score between participants who reported the barrier and those who did not.

Table 4.34

Association between Overall Practice Score and Barriers to VTE Risk Assessment

Barrier	Mann-Whitney U	p-value	Decision (Null Hypothesis)	Significance
Lack of time	1097.50	.267	Not rejected	Not significant
Limited knowledge or training on VTE	**638.00**	**<.001**	**Rejected**	**Significant**
Lack of confidence in performing VTE assessments	**528.50**	**.045**	**Rejected**	**Significant**
Unavailability of assessment tools or resources	**1281.50**	**.010**	**Rejected**	**Significant**
High patient workload	**1566.50**	**.002**	**Rejected**	**Significant**
Lack of support from colleagues or supervisors	476.00	.671	Not rejected	Not significant
Unclear guidelines or protocols for VTE risk assessment	1273.00	.484	Not rejected	Not significant
Belief that VTE risk assessment is unnecessary for some patients	362.00	.547	Not rejected	Not significant

Results:

The Mann-Whitney U tests were conducted for each barrier to examine the association between the overall practice score and various barriers to performing VTE risk assessments. As shown in Table 4.34, half of the barriers did not show a statistically significant association with the practice score, leading to the retention of the H_0. However, the other four barriers: *limited knowledge or training on VTE*, *lack of confidence in performing VTE assessments*, *unavailability of assessment tools or resources*, and *high patient workload*, demonstrated statistically significant associations. This indicates that these barriers are significantly related to differences in the overall practice score.

4.4.9   Comparing Overall Knowledge Scores with VTE Training and Perceived Knowledge

To maintain consistency with the previous analyses, non-parametric tests were also used to compare overall knowledge scores with VTE training and perceived knowledge. Although the Shapiro-Wilk test indicated that the overall knowledge score did not significantly deviate from normality (W(98) = 0.976, p = .065), the proximity of the p-value to the .05 threshold suggests caution. Therefore, Kendall's tau-b correlation was applied for ordinal comparisons, while the Mann-Whitney U test was used for comparisons involving two independent groups, ensuring consistency in the analytical approach.

4.4.9.1   *Association between the Overall Knowledge Score and Attendance at VTE-Related Courses*

Hypotheses:

- *H_0:* There is no significant difference in overall knowledge scores between those who attended VTE-related courses and those who did not.

- *H_1:* There is a significant difference in overall knowledge scores between those who attended VTE-related courses and those who did not.

Results:

A Mann-Whitney U test revealed no significant difference in total knowledge scores between participants who attended VTE-related courses and those who did not (U = 591.5, Z = -1.885, p = .059). As shown in Figure 4.22, the median knowledge score was slightly

higher among non-attendees (Median = 34) compared to attendees (Median = 32), but this difference was not statistically significant. Therefore, the H₀ was not rejected.

Figure 4.22

Distribution of Overall Knowledge Score by Attendance at VTE-Related Courses (Boxplot)
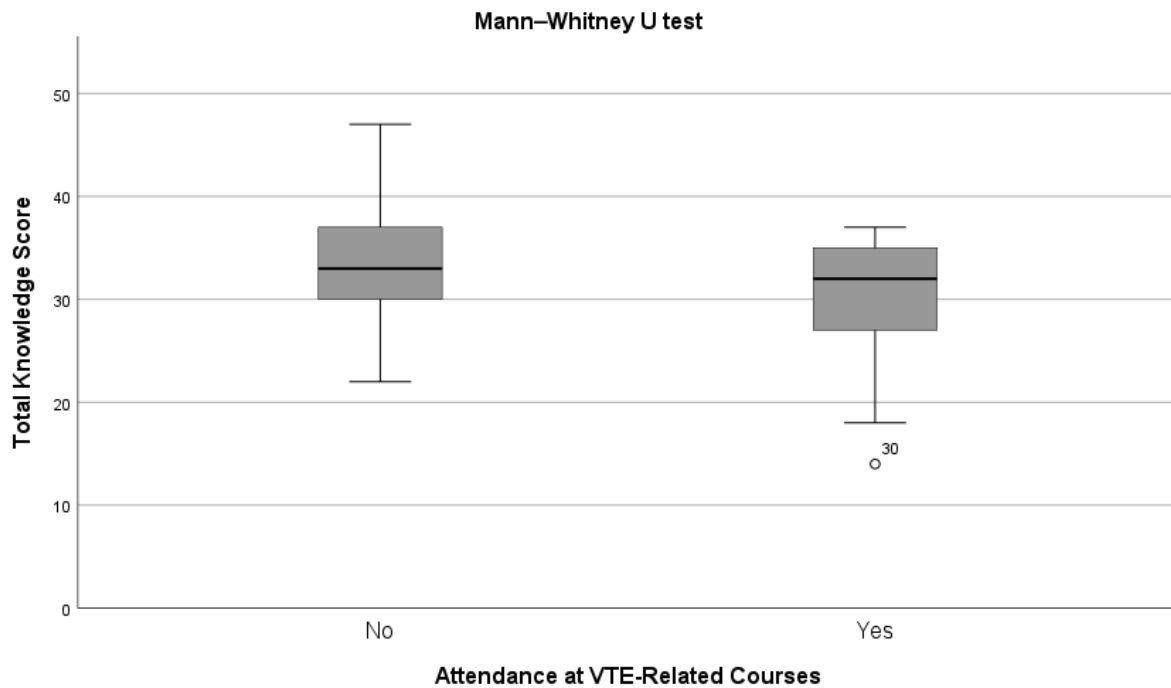
4.4.9.2   *Association between the Overall Knowledge Score and Self-Rated Quality of VTE-Related Courses*

Hypotheses:

- *H₀:* There is no significant correlation between the overall knowledge score and the perceived quality of VTE-related courses.

- *H₁:* There is a significant correlation between the overall knowledge score and the perceived quality of VTE-related courses.

Table 4.35

Kendall's tau-b Correlation between Overall Knowledge Score and Self-Rated Quality of VTE-Related Courses

Variables	Kendall's tau-b	p-value
Overall knowledge score vs. Self-rated quality of VTE-related courses	-0.125	.492

Results:

A Kendall's tau-b correlation showed no significant association between perceived training quality and overall knowledge scores, suggesting that how participants rated the training did not reflect their actual knowledge levels. As presented in Table 4.35, the Kendall's tau-b correlation coefficient indicates a very weak negative relationship between the two variables.

4.4.9.3 Association between the Overall Knowledge Score and Self-Rated Knowledge of VTE Risk Assessment

Hypotheses:

- *H₀:* There is no significant correlation between the overall knowledge score and self-rated knowledge of VTE risk assessment.

- *H₁:* There is a significant correlation between the overall knowledge score and self-rated knowledge of VTE risk assessment.

Table 4.36

Kendall's tau-b Correlation between Overall Knowledge Score and Self-Rated Knowledge of VTE Risk Assessment

Variables	Kendall's tau-b	p-value
Overall knowledge score vs. Self-rated knowledge of VTE risk assessment	-0.021	.798

Results:

As shown in Table 4.36, the Kendall's tau-b correlation revealed no statistically significant association, suggesting that participants' self-rated knowledge was not meaningfully related

to their actual knowledge scores. Despite the absence of a statistically significant correlation, further cross-tabulation analysis between self-rated and actual VTE knowledge scores revealed notable discrepancies. Of the five participants who rated their knowledge as *Excellent*, none achieved the highest score, with some scoring as low as 18 and 35 out of 54. In contrast, several participants who rated themselves as *Good* or *Very Good* obtained scores near the upper range. Notably, one participant who self-rated their knowledge as *Poor* achieved a score of 32, which is mid-range. Similarly, those who rated themselves as *Fair* generally scored moderately (22–43), but none reached the top end of the scale. These findings suggest that some participants may have overestimated or underestimated their knowledge, highlighting a potential gap between perceived and actual understanding of VTE care.

4.4.10   Comparing Overall Knowledge Scores with Practices Related to VTE

4.4.10.1   *Association between the Overall Knowledge Score and Frequency of Performing VTE Risk Assessments*

Hypotheses:

- *H_0:* There is no significant correlation between the overall knowledge score and the frequency of performing VTE risk assessments.

- *H_1:* There is a significant correlation between the overall knowledge score and the frequency of performing VTE risk assessments.

Table 4.37

Kendall's tau-b Correlation between Overall Knowledge Score and Frequency of Performing VTE Risk Assessments

Variables	Kendall's tau-b	p-value
Overall knowledge score vs. Frequency of performing VTE risk assessment	.053	.497

Results:

A Kendall's tau-b correlation, displayed in Table 4.37, revealed no statistically significant correlation between the self-reported frequency of VTE risk assessments and the overall knowledge score, indicating that the mentioned variables are not significantly associated. The

positive correlation coefficient suggests a weak positive relationship, meaning that higher frequencies of VTE risk assessments are slightly associated with higher knowledge scores, but this relationship is not statistically significant.

4.4.10.2 Association between the Overall Knowledge Score and Barriers to Performing VTE Risk Assessments

Hypotheses:

- *H₀:* There is no significant difference in the distribution of overall knowledge scores between participants who reported the barrier and those who did not.

- *H₁:* There is a significant difference in the distribution of overall knowledge scores between participants who reported the barrier and those who did not.

Table 4.38

Association between Overall Knowledge Score and Barriers to VTE Risk Assessment

Barrier	Mann-Whitney U	p-value	Decision (Null Hypothesis)	Significance
Lack of time	961.50	.981	Not rejected	Not significant
Limited knowledge or training on VTE	1149.50	.849	Not rejected	Not significant
Lack of confidence in performing VTE assessments	735.50	.892	Not rejected	Not significant
Unavailability of assessment tools or resources	943.50	.905	Not rejected	Not significant
High patient workload	1201.00	.713	Not rejected	Not significant
Lack of support from colleagues or supervisors	334.00	.212	Not rejected	Not significant
Unclear guidelines or protocols for VTE risk assessment	1237.00	.660	Not rejected	Not significant
Belief that VTE risk assessment is unnecessary for some patients	311.00	.917	Not rejected	Not significant

Results:

The Mann-Whitney U test was performed for each barrier to examine whether there was a statistically significant difference in overall knowledge scores between participants who reported the barrier and those who did not. As shown in Table 4.38, none of the barriers demonstrated a statistically significant association with overall knowledge scores. Consequently, the null hypotheses for each barrier were not rejected, indicating that the presence of these perceived barriers did not significantly impact participants' overall knowledge scores.

4.4.10.3   *Association between the Overall Knowledge Score and the Overall Practice Score*

Hypotheses:

- *H_0:* There is no significant correlation between the overall knowledge score and the overall practice score.
- *H_1:* There is a significant correlation between the overall knowledge score and the overall practice score.

Table 4.39

Kendall's tau-b Correlation between the Overall Knowledge Score and the Overall Practice Score

Variables	Kendall's tau-b	p-value
Overall knowledge score vs. Overall practice score	**0.186**	**.011**

Results:

As shown in Table 4.39, a Kendall's tau-b correlation revealed a statistically significant positive association between overall knowledge scores and overall practice scores. This suggests that participants with higher knowledge scores also reported higher levels of self-efficacy.

4.4.11 Comparing the Overall Knowledge Scores with Self-Reported Assistance in Completing the Questionnaire

To determine whether the overall knowledge score is associated with self-reported assistance in completing the questionnaire (Questions 13a and 13b), separate Mann-Whitney U tests were conducted. Since both questions from Question 13 are categorical variables (Yes/No) and the overall knowledge score is a continuous, non-normally distributed variable, this non-parametric test was deemed appropriate. This analysis was limited to the knowledge score, as these items assess factual understanding and may be more susceptible to bias from external help, unlike self-reported practice behaviours.

Hypotheses:

- H_0: There is no significant difference in the overall knowledge score between participants who reported receiving assistance in completing the questionnaire and those who did not.

- H_1: There is a significant difference in the overall knowledge score between participants who reported receiving assistance in completing the questionnaire and those who did not.

Table 4.40

Association between Overall Knowledge Score and Self-Reported Assistance

Question	Mann-Whitney U	p-value	Decision (Null Hypothesis)	Significance
13a	749.00	.989	Not rejected	Not significant
13b	714.50	.198	Not rejected	Not significant

Results:

Mann-Whitney U tests were conducted to evaluate whether overall knowledge scores differed based on responses to Questions 13a and 13b. As shown in Table 4.40, no statistically significant differences were found between those who reported receiving assistance and those who did not, indicating that self-reported assistance was not associated with overall knowledge scores. However, these findings should be interpreted with caution,

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as some participants may have reported not receiving assistance due to social desirability bias, potentially affecting the accuracy of these results.

4.5 Key Findings

The study found that a large proportion of participants had not attended any formal VTE-related courses, with only 21.4% reporting attendance. Among those who had received training, the majority rated the quality of the information positively. Knowledge of VTE risk factors was moderate, with participants demonstrating strong understanding of common factors, but weaker recognition of less common factors. Self-rated knowledge of VTE risk assessment was significantly associated with ag. The frequency of performing VTE risk assessments varied, with some nurses not conducting them consistently. Key barriers to conducting assessments included limited knowledge and a lack of clear guidelines. The overall practice score, which assessed nurses' confidence in performing VTE-related tasks, indicated moderate self-efficacy. These findings suggest that while participants generally feel confident in VTE prevention and education, there may be a need for additional training in tasks requiring technical or behavioural skills, such as advising at-risk patients to make lifestyle changes or applying mechanical prophylaxis. A significant positive correlation was found between self-rated knowledge and the overall practice score, suggesting that higher perceived knowledge was associated with better VTE-related practices. However, despite the moderate overall knowledge and practice scores, the lack of formal VTE education and the barriers identified highlight the need for targeted educational interventions to improve both knowledge and practice.

4.6 Conclusion

In this chapter, the analysis focused on evaluating the level of knowledge and practices among nurses regarding VTE care. Using both descriptive and inferential statistical methods, the study assessed how demographic variables, self-reported knowledge, and training impacted overall knowledge and practice scores. The overall knowledge and practice scores were derived from responses to various questions within the questionnaire, allowing for a comprehensive analysis. The findings presented in this chapter form the basis for further discussion and interpretation in Chapter 5, situated within the context of existing literature and the study's aims and objectives.

Chapter 5

Discussion

5.1 Introduction

This chapter interprets and discusses the research study's findings in relation to existing literature, as well as the research aim and objectives. It focuses on critically analysing the results to provide a deeper understanding of nurses' knowledge and practices regarding VTE care in critical care settings. Additionally, the chapter also outlines the strengths and limitations of the study.

5.2 Interpretation of Key Findings

Given the rising prevalence of VTE in hospitalised patients and the vital role nurses play in continuous monitoring and care within critical care settings (Ambra et al., 2022), this study aimed to comprehensively assess nurses' knowledge and practices related to VTE care. The primary focus was to evaluate how well critical care nurses understand VTE risk factors, prevention methods, and management strategies, and how this understanding is reflected in their clinical practice. While knowledge is widely recognised as a prerequisite for effective clinical performance, it does not automatically lead to implementation (Davis et al., 1995). As emphasised by Benner (1984), cognitive competence (knowledge) must be complemented by psychomotor skills and supported by favourable clinical conditions to ensure consistent practice. In other words, if nurses lack knowledge, they are unlikely to perform the required tasks; however, even with sufficient knowledge, barriers such as limited resources, time constraints, or unclear protocols may still hinder practical application. To explore this dynamic, the study examined both objectively measured knowledge (via test scores) and self-perceived knowledge, alongside self-reported clinical practices.

One of the key objectives was to explore the influence of demographic and professional characteristics, such as age, years of experience, and prior VTE-specific training, on nurses' knowledge and practices. Another objective was to identify specific gaps in knowledge and practice more broadly, with the aim of informing targeted educational strategies that could ultimately enhance patient outcomes in high-risk environments. Additionally, the study aimed to explore barriers that may affect nurses' understanding and implementation of VTE care, ultimately seeking to improve patient outcomes through enhanced nursing and clinical education in these high-risk settings.

Building on these objectives, the findings highlighted considerable variability in nurses' knowledge and application of VTE-related care. The average knowledge score was 32.5 out

of 54, and the average practice score was 19.97 out of 30, reflecting moderate performance but with wide individual differences. Similar concerns have been reported in other studies; for example, Yohannes et al. (2022) found that just over half of nurses demonstrated good knowledge and fewer than half reported good practice in DVT prevention. The following sub-sections examine these aspects in greater detail, focusing on both practical behaviours and knowledge-related outcomes.

5.2.1   Practices related to VTE care

The study revealed notable variability in nurses' practical behaviours and self-efficacy related to VTE care. While 34.7% of nurses reported conducting risk assessments for most patients, only 24.5% did so for all, indicating inconsistent practice in high-risk critical care settings, where routine VTE risk assessment is recommended for all patients as part of standard preventive care (ACCP, 2021). Additionally, 17.3% of participants reported rarely performing VTE risk assessments, and 1.0% stated they never did so. These findings suggest a deviation from recommended practice and reinforce the need for improved adherence to clinical guidelines. Achieving this requires a multifaceted approach. Educational interventions, such as regular training sessions and accessible resources for healthcare providers, could raise awareness about the importance of VTE risk assessments. Regular audits and feedback mechanisms can also ensure compliance, identifying gaps and reinforcing best practices. Furthermore, strong institutional leadership, along with clear policies, can create a culture of accountability, ensuring that adherence to guidelines becomes a routine part of clinical practice. This aligns with observations by Al-Mugheed and Bayraktar (2023), who reported unsatisfactory VTE-related practices in nearly half of the studies reviewed. Although the percentages differ, the presence of nurses in the current study who rarely or never performed assessments also reflects a similar concern highlighted by Lee et al. (2014), who found that 31% of nurses reported rarely or never conducting such assessments, demonstrating a broader issue of inconsistency in VTE prevention practices across countries.

Further analysis revealed that the frequency of performing VTE risk assessments was significantly associated with three demographic variables: gender ($p = .019$), current unit of work ($p = .032$), and the country where nursing education was completed ($p = .005$). These findings suggest that certain contextual and cultural factors may influence how routinely nurses engage in VTE risk assessment practices. Differences in training emphasis across

countries, unit-specific expectations, or gender-related role perceptions could affect how confidently or consistently nurses perform these tasks. The association with gender, in particular, may reflect traditional role expectations, or differences in confidence and communication styles, with male nurses potentially being less likely to perform routine risk assessments due to these factors (Romem & Rozani, 2024). Alshammari et al. (2023) support this interpretation, reporting that female nurses had higher knowledge scores and more positive perceptions toward VTE prophylaxis than their male colleagues. These findings suggest that gender-related differences in education, confidence, and cultural expectations may shape clinical behaviours such as risk assessment.

By contrast, variables such as age, education level, or overall experience did not significantly affect assessment frequency, indicating that practice inconsistency may stem more from workplace culture and training background than from individual qualifications alone. This finding is somewhat unexpected, as one might anticipate that more experience or higher education levels would correlate with more consistent adherence to VTE risk assessment protocols. However, research indicates that factors like institutional policies, availability of resources, and ongoing professional development opportunities often have a more substantial impact on clinical practices than individual demographics. Workplace culture also plays a key role in guideline adherence, with a supportive environment, strong leadership, and open communication encouraging more consistent practice (Kramer et al., 2010). For instance, a study by Al-Mugheed and Bayraktar (2023) found that nurses' knowledge and practices regarding VTE prevention were more influenced by organisational support and access to training than by their years of experience or educational background. This suggests that enhancing institutional support and providing regular, targeted training may be more effective strategies for improving adherence to VTE risk assessment protocols than focusing solely on education qualifications.

Additionally, a statistically significant positive correlation was found between the frequency of performing VTE risk assessments and overall practice scores, suggesting that nurses who conduct assessments more regularly tend to report higher self-efficacy. This may indicate that regular engagement in VTE-related tasks reinforces confidence and clinical competence through repeated practice. Conversely, it is also possible that nurses with higher self-efficacy are more proactive in performing these assessments, reflecting a reciprocal relationship between confidence and practice. Similar findings were reported by Lee et al.

(2014), who observed that nurses with greater perceived knowledge and confidence demonstrated more consistent VTE prevention practices. However, no significant association was found between assessment frequency and overall knowledge scores in the current study, reinforcing the idea that clinical behaviour is not solely driven by knowledge. Instead, these behaviours may be shaped more strongly by factors such as self-efficacy, access to training, institutional support, and workplace culture, all of which can influence how consistently nurses engage in VTE-related tasks.

In the current study, several barriers to conducting VTE risk assessments were identified, with the most frequently cited being limited knowledge or training on VTE, unclear guidelines or protocols, and high workload. These challenges are consistent with previous research: Silva et al. (2020) reported that 65.4% of nurses cited unclear protocols as a key barrier, and Lee et al. (2014) found that insufficient knowledge was a common concern. Further analysis showed that limited knowledge or training, lack of confidence, unavailability of tools, and high workload were significantly associated with lower practice scores, suggesting these factors directly affect participants' confidence in VTE-related tasks. By contrast, commonly cited barriers such as lack of time or unclear guidelines showed no significant impact on practice in this sample. Understandably, none of the barriers were significantly associated with actual knowledge scores, suggesting that perceived obstacles influence the application of knowledge more than its acquisition, reinforcing the idea that knowledge alone is insufficient for evidence-based practice (EBP). This is further supported by Han et al. (2024), whose mixed-methods systematic review identified limited resources, insufficient training, and institutional constraints as key barriers to implementing VTE guidelines, emphasising the role of systemic and practical challenges over individual knowledge.

Notably, most participants selected only one or two barriers, indicating that perceived obstacles to VTE risk assessment were generally limited. This suggests that targeted interventions addressing specific, commonly reported barriers, such as providing user-friendly risk assessment guidelines or focused training, may be more effective than broad, generalised strategies like hospital-wide awareness campaigns involving posters, emails, or newsletters that raise awareness without offering actionable guidance.

Chi-square analysis also showed that most demographic factors did not significantly influence the number of barriers reported, except for total nursing experience. This suggests

that the barriers nurses face may vary according to their level of experience, potentially due to changes in clinical responsibilities, familiarity with institutional protocols, or capacity to manage workplace demands (Najafi & Nasiri, 2023). For instance, according to Benner's (1984) theory of skill acquisition, less experienced nurses, who are in the *novice* or *advanced beginner* stages, may report more barriers due to limited exposure to VTE assessment tools and uncertainty in clinical decision-making. In contrast, more experienced nurses, who are in the *competent*, *proficient*, or *expert* stages, might report fewer barriers due to greater confidence and efficiency in navigating institutional processes. However, they may encounter different pressures, such as increased administrative duties, oversight responsibilities, or the need to support and manage junior staff; demands that can also impact their capacity to consistently perform VTE risk assessments. Benner's framework helps explain how varying levels of experience can influence both the identification of barriers and the ability to adhere to clinical protocols.

Additionally, analysis of the overall practice score highlighted variability in confidence levels, with scores ranging from 9 to 27 out of a possible 30, and a mean of 19.97. While many participants expressed confidence in patient education tasks, lower confidence levels were reported in tasks requiring behavioural or technical skills. Specifically, advising patients on lifestyle modifications had the lowest mean confidence rating (M = 2.84), followed by the application of mechanical prophylactic devices (M = 3.19). This observation aligns with Silva et al. (2020), who reported that self-efficacy was low among nurses in their study, particularly regarding the use of mechanical devices for VTE prevention. However, this contrasts with findings from Lee et al. (2014), where 84% of nurses reported being *always* or *most of the time* confident in using mechanical VTE devices, and with Oh et al. (2016), who found that approximately half of the nurses indicated they were able to effectively use such devices. These discrepancies suggest that self-efficacy may vary significantly across countries, potentially influenced by differences in training, institutional protocols, or equipment availability.

In the local context of Malta, such differences could stem from limited hands-on training opportunities during undergraduate or workplace education, as well as variability in access to these devices across different hospital wards. For instance, pneumatic compression devices are not always readily available in certain critical care areas, which limits their routine use and reduces opportunities for nurses to develop and maintain confidence in their application.

These factors may contribute to lower confidence levels among nurses and highlight the importance of locally relevant, skills-based training initiatives. In addition, strong institutional support, including clear protocols, adequate staffing, and accessible assessment tools, is essential to enhance practical competence in VTE prevention. Without this support, even well-informed nurses may struggle to apply their knowledge consistently, particularly in high-acuity settings where patient safety is most at risk.

5.2.2   Knowledge related to VTE care

The findings from this study revealed a moderate overall level of VTE knowledge among nurses in critical care settings. While participants generally demonstrated good understanding in recognising common risk factors, such as immobility and hospitalisation, there were clear deficiencies in identifying less familiar or complex risk factors, including nephrotic syndrome and varicose veins. This pattern reflects previous literature, which shows that healthcare professionals often have stronger recognition of well-known risk factors but struggle with rare or underemphasised conditions (Al-Mugheed & Bayraktar, 2023). Such gaps may arise from limited emphasis on uncommon conditions during training and minimal exposure in daily practice.

This variability was evident in the wide range of total scores for risk factor classification, which spanned from 2 to 21 correct responses. Rather than relying solely on general educational interventions, these findings suggest the value of strategies that build on nurses' existing knowledge while specifically targeting less familiar but clinically important factors. Tailoring education in this way may be more effective in improving the identification of at-risk patients and supporting effective VTE prevention strategies. Supporting this, Onianwa et al., (2023) found that although nurses had satisfactory overall knowledge of VTE, many struggled with tasks such as administering anticoagulants and identifying risk factors.

Similar patterns were observed in participants' knowledge of DVT and PE symptoms. While core DVT symptoms such as calf pain (94.9%), swelling (89.8%), and warmth (79.6%) were well recognised, fewer participants correctly identified less commonly discussed signs like dilated superficial veins (24.5%) or groin swelling (23.5%). Notably, 28.6% incorrectly selected pitting oedema as a symptom, indicating some confusion between general fluid retention and DVT-specific signs. Importantly, no participant achieved a full score for DVT symptom knowledge, as even those who correctly identified all seven valid symptoms also

selected at least one incorrect option. Knowledge of PE symptoms was similarly variable, with only 4.1% of participants correctly identifying all nine symptoms, reflecting limited awareness of less typical but clinically significant signs such as haemoptysis and sudden collapse.

These findings align with those of Oh et al. (2016), who reported that nurses commonly failed to recognise atypical symptoms, specifically, groin swelling and cyanosis for DVT, and cough, sweating, and haemoptysis for PE. While this current study did not show a clear difference in overall knowledge levels between DVT and PE, it revealed a consistent pattern: nurses were more confident in recognising common symptoms, particularly those of DVT, which tend to be more localised and visibly prominent. In contrast, PE, though increasingly common in critical care settings, often presents with non-specific or variable symptoms, making it more challenging to identify. This shared pattern of strong recognition of typical signs and limited awareness of less familiar ones, highlights the need for targeted education that reinforces under-recognised but clinically important indicators. Additionally, the integration of comprehensive assessment tools into the overall workflow in critical care can support nurses in identifying these less obvious signs, ensuring timely and accurate diagnosis.

The true/false section assessing application of VTE prevention and management principles in the present study also revealed considerable variability, with a mean score of 7.57 out of 12. This moderate mean suggests that while participants demonstrated some level of understanding, there is significant room for improvement. While some participants answered as few as two items correctly, only 4.1% achieved a full score across all 12 items. This small percentage of participants who obtained a full score highlights the inconsistencies in how well evidence-based knowledge is being applied in practice; a concern that is particularly critical in high-risk settings like critical care, where timely and accurate decision-making is essential. This was further evident in the item-level analysis, which showed a stronger understanding of pharmacological concepts compared to weaker performance on items related to mechanical prophylaxis and clinical risk assessment tools. This difference in performance highlights the inconsistencies in how various aspects of VTE prevention are understood and applied in practice. This may be influenced by how nursing education in Malta has traditionally placed greater emphasis on pharmacological knowledge, often aligned with a more medically driven curriculum, while providing less practical training on non-pharmacological management and structured assessment tools. Limited access to such tools

in some clinical areas, along with a lack of clear local guidelines, may also contribute to lower confidence and familiarity in these areas. These findings point to specific content areas that may benefit from targeted reinforcement for future education. Similarly, Silva et al. (2020) found that nurses answered fewer than 60% of objective VTE questions correctly, and suggested that this limited knowledge may contribute to the inconsistent application of VTE risk assessment in clinical practice.

In addition, knowledge of diagnostic testing was inconsistent. While most participants correctly identified the initial diagnostic test for DVT, nearly a third selected incorrect options. For PE, only 41.8% correctly chose the appropriate initial test. Given the urgency associated with PE, this highlights a significant area for educational improvement, an issue also demonstrated by Oh et al. (2016), who found that only 15% of nurses correctly identified CT scanning as the appropriate diagnostic tool for PE. The overall knowledge score (mean = 32.5 out of 54) further reflects the variation in participants' understanding of VTE-related concepts. While many nurses demonstrated foundational knowledge, a subset exhibited significant knowledge gaps. Considering the total possible score, a mean of 32.5 suggests that, on average, participants have a moderate understanding of VTE-related concepts. However, given that a perfect score is 54, this indicates that there is substantial room for improvement. A score above 40 could be considered adequate, but the mean score of 32.5 highlights the need for targeted interventions to address the knowledge gaps and improve adherence to VTE care protocols.

These findings are consistent with previous research, such as Al-Mugheed and Bayraktar (2023), who found that while some nurses exhibited good knowledge of VTE, others demonstrated inadequate understanding, particularly regarding risk assessment and prophylaxis practices. In contrast, Yu-Fen et al. (2018) reported high knowledge levels in areas such as risk assessment, though significant gaps remained in understanding physical and pharmacological prophylaxis. This highlights how local training practices, such as the emphasis on pharmacological education and limited hands-on experience with mechanical prophylaxis, can impact the depth of VTE-related knowledge. Additionally, variations in clinical exposure to VTE prevention in different hospital wards, coupled with inconsistent access to clear, standardised institutional protocols, contribute to the variability in nurses' ability to apply VTE prevention principles consistently across practice settings.

In summary, in relation to the findings of this study about nurses' varying levels of knowledge and application of VTE prevention and management practices within critical care settings, several key areas of concern have been identified. While participants generally demonstrated strong recognition of common risk factors and symptoms, there were clear gaps in identifying less familiar clinical indicators. Knowledge related to diagnostic testing, mechanical prophylaxis, and clinical risk assessment tools was also inconsistent, reflecting variability in both foundational understanding and practical application. These issues appear to be influenced by the emphasis placed on certain topics during training, availability of local guidelines, and clinical exposure. Together, these findings suggest that while nurses possess a baseline understanding of VTE, there are persistent gaps that could affect the consistency and effectiveness of prevention and management efforts in high-risk environments like critical care.

5.2.3   Impact of Demographic Factors on VTE Knowledge and Practice

The findings of this study revealed no statistically significant associations between any of the assessed demographic variables and overall knowledge or practice scores. This suggests that characteristics such as age, gender, education level, total years of nursing experience, unit of work, experience in the current unit, and country of nursing education may not sufficiently explain how nurses apply VTE-related practices and knowledge in critical care settings.

Although visual data representations suggested slightly higher overall practice scores among nurses working in units like the CCCU or ITU, and among female nurses, these trends were not statistically significant. These results align with previous research, such as that by Alyousef et al. (2022), who reported no significant differences in VTE practice based on demographics. However, it is worth noting that contrasting findings have been reported. A study by Yohannes et al. (2022) found that nurses with more years of experience were more likely to demonstrate good practice compared to those with less experience. The authors attributed this to increased opportunities for peer learning and broader exposure to clinical environments that often come with greater experience. This discrepancy may reflect differences in healthcare systems and training standards. For example, in some settings, experienced nurses may have greater access to structured mentorship programmes, clearer clinical guidelines, or designated time for continuing education; resources that are not equally prioritised or available in all countries. This highlights the complexity of nursing

performance, which can be shaped not only by individual experience but also by institutional support, staffing levels, and access to professional development opportunities.

On the other hand, regarding knowledge, although no statistically significant relationships were found between demographic variables and overall knowledge scores in the current study, some subgroups, such as female nurses or those with more years of experience, showed slightly higher median scores. While not statistically significant, these differences may still hold clinical relevance, particularly in larger or more diverse samples. These findings are consistent with those of Onianwa et al. (2023), who found no significant relationship between demographic characteristics and nurses' general knowledge of VTE prevention, and with Alshammari et al. (2023), who also reported no significant differences based on education, experience, or professional position.

Nevertheless, other studies have observed significant associations. For instance, Alyousef et al. (2022) found a significant relationship between total knowledge scores and years of nursing experience. Similarly, Yu-Fen et al. (2018) reported that nurses who were more educated, had more clinical experience, had received continuing education, and worked in ICUs demonstrated higher knowledge of thromboprophylaxis. Likewise, Yohannes et al. (2022) noted that nurses with higher qualifications and longer clinical experience were more likely to demonstrate strong knowledge of DVT prevention.

These contrasting findings suggest that the relationship between experience and knowledge may vary depending on the healthcare system, educational requirements, and institutional support available in different countries. In the current study, the absence of such associations may reflect local structural factors. For example, in Malta, nurses are not currently required to maintain a professional portfolio or engage in mandatory continuing education following initial registration. Without ongoing educational requirements or incentives, additional years of practice may not necessarily translate into increased or updated clinical knowledge. This highlights the importance of supporting lifelong learning to ensure that experience contributes meaningfully to clinical expertise.

Overall, while some studies suggest that demographic factors may influence VTE knowledge and practice in certain contexts, the consistently non-significant results in the current study emphasise the more substantial role of workplace-related elements, such as

access to updated clinical guidelines, availability of risk assessment tools, adequate staffing, and a workplace culture that supports EBP.

Although all participants worked in high-acuity critical care settings with similar responsibilities and expectations, the observed variability in knowledge and practice scores suggests that factors beyond these shared roles, such as individual experience, training, and access to resources, likely contributed to differences in performance. This highlights the need for institutional support through structured skill-building opportunities, feedback, and access to up-to-date protocols. However, it is also important to acknowledge the individual responsibility of nurses to actively maintain and improve their competence. The International Council of Nurses (ICN, 2021) Code of Ethics clearly states that nurses have a professional obligation to continually update their knowledge and skills. Similarly, the Malta Council for Nurses and Midwives (2019) outlines expectations for ongoing professional development, even though formal continuous professional development (CPD) requirements or portfolio systems are not currently enforced. In the absence of mandatory structures, this responsibility may be inconsistently acted upon. These findings suggest that a dual approach is needed, one that supports individual accountability while ensuring systemic structures are in place to enable and encourage continuous learning.

These findings can also be understood through the lens of Benner's Novice-to-Expert model, which highlights that progression in clinical competence is not solely tied to demographic factors such as years of experience or education level, but rather to the quality and context of that experience. Benner (1984) asserts that expertise is cultivated through experiential learning and meaningful engagement in clinical scenarios, suggesting that two nurses with similar years of experience may operate at different competency levels depending on the quality of their clinical exposure and opportunities for reflective practice. However, barriers identified in this study including high workload, lack of time, and limited access to mentorship or training, can hinder opportunities for the reflective, hands-on learning experiences that are essential for developing higher levels of clinical expertise (Mlambo et al., 2021). Therefore, fostering environments that reduce these barriers, such as by managing workload, providing adequate time for training, offering structured mentorship programmes, and ensuring access to resources for reflective practice, is essential for enabling nurses to translate knowledge into expert-level practice, regardless of their background.

5.2.4   Discrepancy Between VTE Practice and Knowledge

While the results of this study revealed a statistically significant positive correlation between overall knowledge and practice scores, the strength of this association was relatively modest (Kendall's τ = 0.186). This suggests that while knowledge may play a role, other factors likely contribute to variability in confidence and practice-related behaviours. A similar finding was reported by Alyousef et al. (2022), who noted a positive but statistically non-significant association between total knowledge and practice (p = 0.075). These findings reinforce the notion that being knowledgeable does not automatically lead to more consistent or effective practice.

This is consistent with previous research showing that knowledge alone is not sufficient to ensure effective clinical practice (Al-Mugheed & Bayraktar, 2023; Silva et al., 2020). Barriers such as workload, time constraints, organisational culture, and limited access to resources can significantly hinder the application of evidence-based care. For instance, Alqahtani et al. (2022) reported that most primary healthcare nurses in Saudi Arabia faced notable barriers to implementing EBP, with 52.3% experiencing a moderate extent of barriers, 37.7% encountering them to a great extent, and only 5.7% reporting minimal barriers. This highlights the need to address both cognitive and systemic factors when aiming to improve nursing practice. Similarly, the findings of this study underscore the importance of addressing these factors, as the variability in knowledge and practice scores suggests that both individual understanding and external support structures play crucial roles in enhancing VTE prevention practices. Enhancing clinical performance may therefore require not only knowledge-focused interventions but also structural support, such as mentorship, structured feedback, and CPD, which may include regular training sessions, workshops, simulation training, and opportunities for reflective practice.

These findings also align with Benner's Novice-to-Expert model, which emphasises that clinical expertise develops through experience and contextual application, not just knowledge acquisition. According to Benner (1984), nurses progress from *novice* to *expert* by engaging in real-world practice, where they refine their judgement and develop intuition over time. In the current study, however, no statistically significant association was found between years of experience or age and overall knowledge or practice scores. This supports Benner's view that expertise is not simply a function of time served, but of meaningful, reflective engagement in practice. The observed variability in self-efficacy, particularly in tasks requiring technical or

behavioural skills, suggests that nurses in this sample may occupy different stages along Benner's continuum, regardless of their years in the profession. These findings reinforce the need for tailored support that focuses not only on knowledge acquisition but also on the development of confidence and competence in applying that knowledge within complex clinical environments (Shin et al., 2023).

5.2.5   Impact of Prior Training on VTE Knowledge and Practice

Despite the recognised importance of formal education and continuous training in improving nursing competencies, this study found no statistically significant associations between attendance at VTE-related courses or perceived course quality, and nurses' actual knowledge or practice scores. Notably, only 21.4% of participants reported having attended any VTE-related training. Among those who had, the majority rated the quality of information positively, with over 95% rating it as either *Good*, *Very Good*, or *Excellent*. This highlights a mismatch between the perceived value of training and its overall accessibility, suggesting that limited participation, rather than low quality, may be a contributing factor to the lack of significant impact.

While practice scores were slightly higher among those who had attended training, and knowledge scores marginally higher among non-attendees, neither difference reached statistical significance. This supports previous research questioning the effectiveness of one-off educational interventions in producing measurable clinical improvements, possibly due to variability in content, delivery methods, duration, or lack of follow-up (Davis et al., 1999). Passive learning alone may not be sufficient to change practice behaviours unless supplemented by hands-on training, mentorship, and regular updates to clinical protocols. A systematic review by Al-Mugheed and Bayraktar (2023) echoed this view, emphasising the value of continuous education in improving VTE-related knowledge and practice.

To inform future local training opportunities, which is one of the stated objectives, further analysis in the present study explored whether attendance at VTE-related courses varied by demographic factors. Most variables, including age, gender, education level, and total nursing experience, showed no significant associations. However, two factors did: the total period of experience in the current unit (p = .032) and the country where nursing education was completed (p < .001). This shows that nurses with more experience in their current unit appeared more likely to have attended VTE-related training, which may suggest that longer

time within a specific clinical environment fosters greater familiarity with institutional training opportunities or stronger integration into ward-based professional development. Moreover, the country of nursing education was associated with VTE-related training attendance. However, this association should be interpreted with caution, as the sample included very few participants educated outside the EU, which may have influenced the result and limits the generalisability of the finding. These findings suggest that contextual and experiential factors can influence access to training, aligning with broader literature indicating that geographic and institutional settings significantly shape participation in professional development opportunities (Sandholtz & Ringstaff, 2016). Alyousef et al. (2022) similarly found that previous DVT education was significantly associated with higher knowledge scores, especially among nurses with more experience. Other demographic variables, such as age and gender, had no impact, reinforcing the idea that experience and direct training are more influential than sociodemographic characteristics alone.

Silva et al. (2020) added to this understanding by highlighting the positive effects of in-service education. In their study, 40% of nurses had participated in such programmes, with nearly 70% rating the training quality as excellent. Their findings are supported by other studies, which report that limited participation in in-service education is linked to lower self-confidence in knowledge (Oh et al., 2017), whereas greater involvement correlates with more positive self-assessments (Lee et al., 2014). Consistent with these patterns, Yu Fen et al. (2018) found that nationally recognised professional training was associated with the highest knowledge scores. However, only 2.68% of their sample had accessed such training, while over half had only received hospital-based education. Although regional programmes showed slightly better outcomes than hospital-level ones, the difference was not statistically significant.

Taken together, these findings found that while nurses generally rated VTE-related training as high quality, only a small number had access to it. Training attendance did not significantly impact knowledge or practice scores, suggesting that occasional sessions may not be enough to improve performance. Instead, ongoing, well-supported training that fits the local context appears more effective.

5.2.6   Self-Perceived Knowledge vs. Objective Knowledge

The findings of this study reveal a notable discrepancy between nurses' self-rated knowledge of VTE risk assessment, assessed using a single Likert-scale item, and their objectively measured practice and knowledge scores. While a statistically significant positive correlation was found between self-rated knowledge and self-efficacy, measured through the overall practice score based on confidence ratings for VTE-related tasks, no such correlation existed between self-rated knowledge and the overall knowledge score, which was derived from objective test items. This suggests that nurses who perceive themselves as knowledgeable also tend to feel more confident in their ability to perform VTE-related tasks. However, this confidence does not necessarily correspond with accurate or comprehensive knowledge, highlighting a key finding of this research; that perceived confidence does not always reflect actual competence in VTE care.

Further analysis reinforced this misalignment, as participants who rated their knowledge as *Excellent* did not necessarily achieve high scores on the objective knowledge test, and in some cases, scored markedly lower than peers who had rated themselves more modestly. Such misplaced confidence may have critical implications in clinical practice, as it could lead to errors in judgment or inappropriate application of VTE protocols (Berner & Graber, 2008). This pattern may also stem from limited exposure to formal training or current guidelines, as without ongoing education, individuals may unknowingly overestimate their competence due to a lack of awareness about existing knowledge gaps. In contrast, attending structured training can often highlight these gaps and prompt more accurate self-assessment (Khalil & Abou Hashish, 2022).

Conversely, nurses who scored well on the objective knowledge test but rated themselves as only *Fair* or *Good* may be demonstrating cautious self-assessment. This could reflect underconfidence influenced by limited clinical exposure or cultural norms that discourage self-promotion. Alternatively, it may indicate a strong awareness of the need for ongoing learning, a mindset that aligns with professional values promoting lifelong development. As noted by Al-Mugheed and Bayraktar (2023), nurses who regularly engage in reflective practice tend to evaluate their knowledge more conservatively, recognising that competence evolves over time.

Similarly, Silva et al. (2020) highlight a significant gap between nurses' self-perceived and actual knowledge of VTE, with many nurses rating their knowledge as good despite lower objective test scores. This finding is consistent with results from Al-Mugheed and Bayraktar (2023), which show that overreliance on self-assessment may mask real knowledge gaps, potentially impacting clinical outcomes. These findings highlight the importance of integrating objective assessments into educational and professional development programmes, ensuring that confidence is supported by competence. Educational strategies should therefore go beyond self-perception and incorporate structured feedback, reflective learning, and competency-based evaluations to enhance both clinical performance and patient outcomes.

This discrepancy between perceived and actual knowledge can be interpreted through Benner's Novice-to-Expert model, which describes how nurses develop competence through practical experience over time. According to Benner, nurses at earlier stages of development may lack the situational awareness needed to accurately judge their competence, relying instead on abstract principles or protocols. As nurses gain experience and move through the stages toward proficiency and expertise, their ability to reflect on and evaluate their knowledge becomes more refined. In this context, some participants may have rated their knowledge highly due to confidence in task performance (self-efficacy), while lacking the deeper conceptual understanding required for comprehensive care, potentially explaining the misalignment between perceived and actual knowledge. Conversely, others may have rated their knowledge more modestly not because of underconfidence, but due to a heightened awareness of the need for ongoing learning and improvement, which is a recognised trait in more reflective or experienced nurses (Younas et al., 2020).

5.2.7 Influence of Self-Reported Assistance on Knowledge Outcomes

Although the majority of participants indicated that they completed the questionnaire independently, a small proportion reported seeking assistance from others or consulting external sources. While the findings showed no statistically significant association between self-reported assistance and overall knowledge scores. However, this result should be interpreted with caution. Despite the questionnaire being anonymous, there remains the possibility that some participants underreported seeking assistance due to social desirability bias. This could obscure the true extent of assistance and its potential impact on knowledge scores. Nonetheless, the absence of a statistically significant differences and moderate scores

may suggest that any external help received did not meaningfully influence performance, or that it was used selectively for questions where participants felt less confident.

5.3 Strengths and Limitations

This study possesses several notable strengths that enhance the credibility and relevance of its findings, particularly in light of its aim to evaluate nurses' knowledge and practices regarding VTE care in critical care settings. By focusing on a high-risk clinical environment where nurses are at the forefront of patient monitoring and intervention, the study addresses a crucial area in patient safety and healthcare quality. The insights gathered are therefore directly applicable to enhancing clinical practice and improving outcomes for hospitalised patients at risk of VTE.

A significant strength of the study lies in the use of whole population sampling, wherein all 125 nurses working across critical care areas in an acute hospital in Malta were invited to participate. With 98 nurses responding (a response rate of 78.4%), the sample provides a strong representation of the target population and reduces the risk of sampling bias. This high level of participation enhances internal validity and offers a comprehensive picture of VTE-related knowledge and practices within the institution.

The study also adopted a comprehensive and multidimensional approach by assessing not only participants' knowledge of VTE risk factors, assessment protocols, and prevention strategies, but also their self-perceived knowledge and self-reported practices. This enabled a clearer insight into the ways in which knowledge corresponds, or does not correspond, with nurses' confidence and how they carry out VTE-related care in practice. In line with the study's objectives, this approach enabled the identification of specific gaps and inconsistencies, which are essential for designing targeted educational and training interventions aimed at improving clinical practice and enhancing adherence to VTE care protocols.

Furthermore, the study employed robust statistical methods, including chi-square analyses and non-parametric correlation coefficients, to explore associations between knowledge, practice behaviours, and demographic or contextual variables. These analytical techniques were appropriately selected and carefully applied, ensuring that the interpretation of findings was both valid and grounded in the data. The integration of Benner's Novice-to-Expert model

also strengthened the study's conceptual framework. This helped interpret the findings in a more meaningful way by placing differences in knowledge and practice within the wider context of clinical development and hands-on learning. The model also supported the study's focus on translating knowledge into meaningful clinical actions, an essential consideration given the study's aim to improve patient outcomes through enhanced nursing education and support.

Despite these strengths, several limitations must be acknowledged. While the use of whole population sampling adds to the internal consistency of the study, the fact that the sample was drawn from a single institution limits the generalisability of the findings to other settings. Differences in training standards, institutional protocols, or resource availability elsewhere may influence both knowledge and practices related to VTE care. Additionally, the cross-sectional design of this study, where data was collected at a single point in time, limits the ability to determine how variables influence each other. Although relationships were observed between knowledge, practice, and certain demographic factors, it is not possible to establish whether one factor leads to changes in another. This design also does not capture how these variables might evolve over time, making it difficult to assess trends or developments in practice and learning.

Another limitation arises from the reliance on self-reported data, particularly in the assessment of practice and confidence. Such data are inherently susceptible to social desirability bias, where participants may overestimate adherence to best practices or underreport deficiencies. Moreover, a small number of participants acknowledged receiving assistance in completing the questionnaire, and it is plausible that others did so without disclosure, potentially influencing score accuracy. In addition, since survey participation was voluntary and participants could skip questions they did not wish to answer, there is a potential for response bias and missing data. Given the demands of a critical care environment, it is also possible that some questionnaires were completed hurriedly or that questions were skipped due to time pressures and workload. Unanswered questions were automatically scored as incorrect, which could have slightly impacted knowledge scores; however, this was not common across the sample, and most participants completed the questionnaire thoroughly, limiting the overall effect on the dataset. Although the anonymity of the questionnaire may have helped reduce reporting bias, these factors combined could have influenced the reliability of the findings.

Furthermore, while the knowledge assessment was comprehensive, it primarily focused on recognition-based understanding, such as identifying risk factors or diagnostic tools, rather than evaluating nurses' deeper clinical reasoning or judgement. As such, it may not fully capture the complexity of decision-making required in dynamic, real-world care settings. This could limit the extent to which test performance reflects clinical competence in practice.

Additionally, certain elements of the questionnaire design presented limitations. For example, in the DVT symptom recognition item, only one incorrect response option was included. While this highlighted a specific misconception, having just a single incorrect answer made it difficult to draw meaningful conclusions about the extent of participants' misunderstandings. In contrast, the item on PE symptoms included only correct options. As a result, participants may have selected all responses by default, rather than critically evaluating each one. This reduced the item's ability to accurately assess participants' recognition of VTE symptoms and its overall usefulness as a measure of knowledge. Another limitation relates to a question that asked participants to rate the VTE risk assessment knowledge of their colleagues. Although this may have been intended to provide insight into perceptions of team knowledge or unit culture, it did not contribute meaningfully to the analysis and was not included in any comparative sections. While the use of a previously validated questionnaire is a strength of this study, its design permitted only minor modifications due to ethical and methodological considerations.

Finally, although the study sought to explore the impact of prior training on nurses' knowledge and practices, the low rate of participation in VTE-related education (21.4%) limited the ability to draw firm conclusions. While the majority of those who had attended training rated it positively, the small number reduced the statistical power to detect significant effects, potentially underestimating the value of structured professional development. Despite these limitations, the findings offer meaningful insights into the knowledge and clinical behaviours of critical care nurses in relation to VTE prevention and management. By identifying both knowledge gaps and barriers to effective practice, the study supports the need for targeted educational and organisational improvements in this high-risk area of care.

5.4 Conclusion

This chapter explored the key findings in relation to the study's objectives and the existing literature. It highlighted knowledge gaps, variable practice behaviours, and the influence of

systemic and institutional barriers on VTE care in critical care settings. These findings reinforce that improving patient outcomes requires more than knowledge alone, it depends on creating well-supported environments that enable nurses to apply their skills with confidence and consistency. This study provides practical evidence relevant to critical care settings, offering a basis for advancing nursing education, policy development, and VTE care practices. The final chapter will present the overall conclusions and offer targeted recommendations for practice, education, and future research.

Chapter 6

Conclusion

6.1 Introduction

The purpose of this study was to assess the knowledge and practices of critical care nurses regarding VTE assessment, prevention and management, with the broader aim of identifying gaps and informing targeted educational and clinical interventions. This chapter presents the overall conclusions drawn from the study's findings, reflecting on the extent to which the research aim and objectives were achieved. It also outlines recommendations for nursing practice, education, and future research, based on the evidence obtained, to support the advancement of VTE care in critical care settings.

6.2 Summary of the Study

VTE remains a significant cause of morbidity and mortality among hospitalised patients, particularly in critical care settings where patients are often at higher risk due to immobility, invasive procedures, and comorbidities. Given the essential role that nurses play in continuous monitoring, risk assessment, and implementation of preventative measures, understanding their knowledge and practices regarding VTE care is crucial for improving patient outcomes. This study was designed to generate insights that can inform educational strategies and clinical improvements in VTE prevention and management.

The study aimed to evaluate knowledge levels and practice behaviours related to VTE among nurses working in critical care areas, determine whether demographic and professional factors influenced knowledge and practice, and identify specific gaps that could benefit from targeted educational interventions. A cross-sectional, quantitative design was employed, using a structured questionnaire adapted from a validated tool. Data were collected from 98 nurses working in critical care units of a single hospital, achieving a strong response rate of 78.4%. Descriptive and inferential statistical methods, including non-parametric tests, were used to analyse the data.

Key findings revealed moderate knowledge levels and practice scores among participants. Several barriers to effective VTE-related practice were identified, including limited knowledge, workload pressures, and unclear protocols. No significant associations were found between demographic characteristics and knowledge or practice outcomes. In addition, a discrepancy was noted between nurses' self-rated knowledge and their measured knowledge, suggesting a need for more objective assessments and reflective learning strategies. These results highlight opportunities for strengthening practical education and

enhancing institutional support to better enable critical care nurses to consistently apply evidence-based VTE prevention and management strategies.

6.3 Conclusions Drawn from the Findings

Overall, the study successfully achieved its aim of assessing critical care nurses' knowledge and practices regarding VTE care, exploring the influence of demographic and professional factors, and identifying specific gaps to inform targeted educational and clinical interventions, thereby providing important insights into both the strengths and limitations of current nursing practice in this area.

The evaluation of critical care nurses revealed considerable variability in knowledge levels. While most participants correctly identified common VTE risk factors such as immobility and hospitalisation, gaps were evident in recognising less familiar risk factors and symptoms. Knowledge of pharmacological prevention strategies was relatively strong; however, understanding and application of mechanical prophylaxis and clinical risk assessment tools were notably weaker. Practice behaviours also demonstrated variability, especially in the frequency and consistency of VTE risk assessments and tasks requiring technical skills, highlighting areas where further training and support may be needed.

An analysis of demographic and professional characteristics revealed that variables such as age, gender, education level, years of experience, and unit of work did not meaningfully influence knowledge or practice scores. Similarly, participation in VTE-related courses was low, and attending training did not significantly influence scores, although training was rated positively by those who attended. These findings suggest that factors beyond individual demographics, such as workplace environment, availability of resources, and institutional support, may play a more critical role in shaping VTE-related knowledge and practice.

Finally, the identification of specific gaps in knowledge and practice highlighted the need for targeted interventions. Limited understanding of certain risk factors and diagnostic processes, inconsistent use of mechanical prophylaxis, and barriers such as high workload, limited training access, and unclear protocols were all evident. Importantly, a statistically significant but modest correlation was observed between knowledge and practice scores, emphasising that knowledge, while necessary, is not sufficient on its own to ensure consistent clinical performance. This finding highlights the critical need for supportive workplace

structures, targeted training, and ongoing skill development to bridge the gap between understanding and effective practice.

Collectively, these conclusions emphasise the need for structured educational initiatives, enhanced clinical support, and organisational improvements to strengthen VTE prevention and management practices among critical care nurses. Throughout this study, the researcher has gained a deeper understanding of the complexities surrounding VTE care and the factors influencing nursing practice. The researcher has developed the ability to critically evaluate data, conduct literature reviews, and identify gaps in clinical practice. This experience has reinforced the importance of EBP and highlighted the need for continuous education, providing valuable insights that can inform future nursing practice, particularly in clinical decision-making and patient safety.

6.4 Implications for Nursing Education

The findings of this study highlight important implications for nursing education, both at the undergraduate level and within ongoing in-service training. Although participants demonstrated a moderate level of VTE knowledge, notable gaps were observed. These findings suggest that nursing curricula should place greater emphasis on the comprehensive assessment and prevention of VTE, ensuring that nurses are fully equipped to manage this significant patient safety issue. Furthermore, focused education on the practical application of mechanical prophylaxis devices, such as intermittent pneumatic compression and graduated compression stockings, should be reinforced, given the lower confidence levels reported in this area. Educational programmes should not only cover common VTE risk factors and symptoms but also provide deeper instruction on less typical presentations and advanced diagnostic considerations. In addition to traditional teaching methods, there is a need for more simulation-based, case study-driven, and competency-focused approaches in VTE education.

Efforts should also be made toward expanding access to VTE-specific training opportunities and enhancing awareness of the availability of this training among nurses. Practical skills training and structured reflective exercises can help bridge the gap between theoretical knowledge and clinical practice, fostering greater confidence and critical thinking among nurses. In-service education programmes should also be delivered regularly, using updated evidence-based guidelines, to maintain and enhance nurses' competencies over time.

6.5 Implications for Nursing Practice

Strengthening nursing education is a vital step; however, translating knowledge into consistent practice also requires attention to the organisational and clinical environments in which nurses operate. Building on these educational needs, the study's findings also highlight important implications for nursing practice, particularly in ensuring consistent VTE assessment and prevention in critical care settings. The observed variability in the frequency and consistency of VTE risk assessments suggests a need for strengthening practice behaviours. Standardised protocols and routine incorporation of VTE risk assessments into daily nursing practice should be prioritised. Practical tools such as routine documentation, structured checklists and clearly defined policies may support nurses in performing assessments systematically and confidently. Additionally, the finding that workload pressures and the absence of clear protocols were perceived barriers highlights the importance of ensuring that organisational support structures are robust. Nurse managers and healthcare leaders should review staffing models, reinforce the availability of VTE assessment tools, and ensure that guidelines are easily accessible and straightforward to follow.

Furthermore, the modest correlation observed between knowledge and practice underscores that even when knowledge exists, external factors can inhibit its consistent application. Thus, supportive practice environments that encourage adherence to VTE prevention protocols are essential. Nursing leadership should foster a workplace culture focused on preventative care, ensure adequate time for thorough assessments, and promote reflective practice to help embed VTE care as a consistent nursing priority. Additionally, attention should be given to the availability of necessary equipment, particularly pneumatic compression devices, which are limited in certain wards. Moreover, ongoing monitoring and auditing of VTE risk assessment practices could also help maintain consistency and ensure adherence to evidence-based protocols.

Overall, strengthening institutional support, enhancing workflow structures, and fostering a culture of accountability are imperative steps toward improving VTE care delivery by critical care nurses and may help address resistance to change and reinforce adherence to best practices.

6.6 Recommendations for Future Research

This study has contributed valuable insights into critical care nurses' knowledge and practices regarding VTE prevention and management; however, several areas warrant further investigation. Given the relatively small and context-specific sample used in this study, future research should aim to include larger and more diverse populations across multiple institutions. Broader sampling would improve the generalisability of findings and provide a more comprehensive understanding of VTE-related knowledge and practices among critical care nurses. Notably, while some statistical reports, narrative reviews, and clinical audits related to VTE exist, no published empirical studies were identified that specifically address this research topic within the local healthcare setting. In addition, research focusing on VTE-related knowledge and practices among critical care nurses within Europe remains minimal. In fact, all studies included in the literature review were conducted outside of Europe, highlighting a significant gap and the need for region-specific investigations.

Because this study employed a cross-sectional design, it was limited to capturing relationships at a single point in time, making it impossible to understand which factor influences the other, or whether one factor directly causes changes in another. To better understand how knowledge, confidence, and practice behaviours evolve, longitudinal research following participants over time is recommended. Similarly, experimental designs, such as interventions with pre- and post-testing, could help evaluate the effectiveness of targeted educational or organisational initiatives aimed at improving VTE care outcomes.

In addition, as this study relied primarily on self-reported data, observational research should be considered as a next step. Approaches such as point prevalence surveys or direct observational audits could provide more objective insights into actual VTE care behaviours in clinical settings, helping to validate and extend the findings reported here. While establishing a baseline through knowledge and practice assessments, as undertaken in this study, remains a justified and valuable approach, particularly for capturing the current local context, future observational methods would complement this by assessing how knowledge translates into practice.

Furthermore, while this study explored associations between demographic factors and VTE knowledge and practices, the impact of organisational and systemic factors, including leadership support, staffing levels, and institutional culture, requires more detailed investigation. Future research could investigate how these contextual variables influence

nurses' ability to consistently apply VTE prevention and management strategies in high-risk environments.

Future qualitative research is recommended to explore the underlying reasons behind the mismatch between nurses' self-rated and actual knowledge of VTE. In-depth interviews or focus groups could provide valuable insights into how nurses assess their own competence, the role of confidence and experience in self-evaluation, and the extent to which reflective practice influences self-perception. Such studies could help clarify whether over- or underestimation of knowledge stems from educational gaps, cultural factors, or workplace dynamics, ultimately informing the design of more targeted educational interventions.

6.7 Conclusion

This study has provided valuable insights into critical care nurses' knowledge and practices regarding VTE prevention and management, highlighting both areas of strength and opportunities for improvement. While enhancing knowledge through education remains vital, the findings emphasise that education alone is insufficient to ensure consistent EBP. Organisational support, through committed leadership, accessible protocols, and manageable workloads, is essential to empower nurses in effectively applying VTE care strategies. Thus, improving knowledge and strengthening clinical practice must be approached as interdependent goals. Moving forward, a multifaceted strategy is required: one that advances nursing education, optimises clinical environments, and embeds VTE care as a consistent nursing priority through supportive policy development. Sustained efforts in these areas are critical to delivering safe, high-quality care and reducing the incidence of VTE in critically ill patients.

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APPENDICES

Appendix A – CASP for Descriptive/Cross-Sectional Studies

CASP Checklist:
For Descriptive/Cross-Sectional Studies

Reviewer Name:	
Paper Title:	
Author:	
Web Link:	
Appraisal Date:	

During critical appraisal, never make assumptions about what the researchers have done. If it is not possible to tell, use the "Can't tell" response box. If you can't tell, at best it means the researchers have not been explicit or transparent, but at worst it could mean the researchers have not undertaken a particular task or process. Once you've finished the critical appraisal, if there are a large number of "Can't tell" responses, consider whether the findings of the study are trustworthy and interpret the results with caution.

Section A: Are the results valid?		
1. Did the study address a clearly focused issue?	☐Yes ☐ No ☐ Can't Tell	
CONSIDER: *A question can be 'focused' in terms of* • *the population studied* • *the risk factors studied* • *is it clear whether the study tried to detect a beneficial or harmful effect* • *the outcomes considered*		
2. Did the authors use an appropriate method to answer their question?	☐Yes ☐ No ☐ Can't Tell	
CONSIDER: • *Is a descriptive/cross-sectional study an appropriate way of answering the question* • *did it address the study question*		
3. Were the subjects recruited in an acceptable way?	☐Yes ☐ No ☐ Can't Tell	
CONSIDER: *We are looking for selection bias which might compromise the generalisability of the findings:* • *Was the sample representative of a defined population* • *Was everybody included who should have been included*		
4. Were the measures accurately measured to reduce bias?	☐Yes ☐ No ☐ Can't Tell	
CONSIDER: *Look for measurement or classification bias:* • *did they use subjective or objective measurements* • *do the measurements truly reflect what you want them to (have they been validated)*		
5. Were the data collected in a way that addressed the research issue?	☐Yes ☐ No ☐ Can't Tell	

2

CONSIDER:
• *if the setting for data collection was justified*
• *if it is clear how data were collected (e.g., interview, questionnaire, chart review)*
• *if the researcher has justified the methods chosen*
• *if the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews were conducted?)*

6. Did the study have enough participants to minimise the play of chance?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:
• *if the result is precise enough to make a decision*
• *if there is a power calculation. This will estimate how many subjects are needed to produce a reliable estimate of the measure(s) of interest.*

7. How are the results presented and what is the main result?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:
• *if, for example, the results are presented as a proportion of people experiencing an outcome, such as risks, or as a measurement, such as mean or median differences, or as survival curves and hazards*
• *how large this size of result is and how meaningful it is*
• *how you would sum up the bottom-line result of the trial in one sentence*

8. Was the data analysis sufficiently rigorous?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:
• *if there is an in-depth description of the analysis process*
• *if sufficient data are presented to support the findings*

9. Is there a clear statement of findings?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:
• *if the findings are explicit*
• *if there is adequate discussion of the evidence both for and against the researchers' arguments*
• *if the researchers have discussed the credibility of their findings*
• *if the findings are discussed in relation to the original research questions*

10. Can the results be applied to the local population?	☐ Yes ☐ No ☐ Can't Tell

3

11. How valuable is the research?	☐ Yes ☐ No ☐ Can't Tell

CONSIDER:
• one descriptive/cross-sectional study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making
• if the researcher discusses the contribution the study makes to existing knowledge (e.g., do they consider the findings in relation to current practice or policy, or relevant research-based literature?)
• if the researchers have discussed whether or how the findings can be transferred to other populations

APPRAISAL SUMMARY: *List key points from your critical appraisal that need to be considered when assessing the validity of the results and their usefulness in decision-making.*

Positive/Methodologically sound	Negative/Relatively poor methodology	Unknowns

Referencing recommendation:

CASP recommends using the Harvard style referencing, which is an author/date method. Sources are cited within the body of your assignment by giving the name of the author(s) followed by the date of publication. All other details about the publication are given in the list of references or bibliography at the end.

Example:

Critical Appraisal Skills Programme (2024). CASP (insert name of checklist i.e. cross sectional Checklist.) [online] Available at: insert URL. Accessed: insert date accessed.

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5

Appendix B – CASP for Systematic Review

CASP Checklist: 10 questions to help you make sense of a Systematic Review

How to use this appraisal tool: Three broad issues need to be considered when appraising a systematic review study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 10 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Systematic Review) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

CASP
Critical Appraisal
Skills Programme

Paper for appraisal and reference:

1. Did the review address a
   clearly focused question?

   Yes ☐
   Can't Tell ☐
   No ☐

   HINT: An issue can be 'focused' In terms of
   • the population studied
   • the intervention given
   • the outcome considered

Comments:

2. Did the authors look for the
   right type of papers?

   Yes ☐
   Can't Tell ☐
   No ☐

   HINT: 'The best sort of studies' would
   • address the review's question
   • have an appropriate study design
   (usually RCTs for papers evaluating
   interventions)

Comments:

Is it worth continuing?

3. Do you think all the
   important, relevant studies
   were included?

   Yes ☐
   Can't Tell ☐
   No ☐

   HINT: Look for
   • which bibliographic databases were
   used
   • follow up from reference lists
   • personal contact with experts
   • unpublished as well as published studies
   • non-English language studies

Comments:

4. Did the review's authors do enough to assess quality of the included studies?

Yes ☐
Can't Tell ☐
No ☐

HINT: The authors need to consider the rigour of the studies they have identified. Lack of rigour may affect the studies' results ("All that glisters is not gold" Merchant of Venice – Act II Scene 7)

Comments:

5. If the results of the review have been combined, was it reasonable to do so?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
• results were similar from study to study
• results of all the included studies are clearly displayed
• results of different studies are similar
• reasons for any variations in results are discussed

Comments:

Section B: What are the results?

6. What are the overall results of the review?

HINT: Consider
• If you are clear about the review's 'bottom line' results
• what these are (numerically if appropriate)
• how were the results expressed (NNT, odds ratio etc.)

Comments:

7. How precise are the results?

Comments:

Section C: Will the results help locally?

8. Can the results be applied to the local population?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- the patients covered by the review could be sufficiently different to your population to cause concern
- your local setting is likely to differ much from that of the review

Comments:

9. Were all important outcomes considered?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- there is other information you would like to have seen

Comments:

10. Are the benefits worth the harms and costs?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- even if this is not addressed by the review, what do **you** think?

Comments:

Appendix C – Original Questionnaire

UCIMC Nurse Survey on Venous Thromboembolism (VTE)
Risk Assessment and Prevention
Survey Instrument - with Answer Key

Demographics:

1. **Age**:

   ☐ 18-25

   ☐ 26-35

   ☐ 36-45

   ☐ 46-55

   ☐ Above 56

2. **Gender**:

   ☐ Male

   ☐ Female

3. **Your highest level of education in nursing:**

   ☐ Associate Degree

   ☐ BSN

   ☐ MSN

   ☐ DNP

   ☐ PhD

4. **Length of time as an RN:**

   ☐ 6–12 months

   ☐ 1–3 years

   ☐ 4–6 years

   ☐ 7–10 years

   ☐ More than 10 years

5. Your current unit of work:

☐ Medical

☐ Surgical

☐ Orthopaedic

☐ Oncology

☐ Rehab

☐ ICU/CCU

☐ OBGYN

☐ ER/Urgent Care

☐ Other

6. Length of time as an RN in your current unit:

☐ 6–12 months

☐ 1–3 years

☐ 4–6 years

☐ 7–10 years

☐ More than 10 years

7. **Country where you completed your nursing education:**

☐ United States

☐ Other

Please answer the following questions by ticking (✓) the responses that best reflect your knowledge and practice.

1. **Have you ever attended a course or an in-service program that provided information on venous thromboembolism (VTE) risk assessment and prevention?**

   ☐ Yes   ☐ No

   a. **If yes, how would you rate the quality of the information provided in that programme?**

      ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

2. **How would you rate your overall knowledge of venous thromboembolism (VTE) risk assessment?**

   ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

3. **How frequently do you perform a VTE risk assessment on your patients?**

   ☐ Never   ☐ Rarely   ☐ For about half of my patients   ☐ For most of my patients

   ☐ For all of my patients

4. **What are the main barriers you encounter in providing VTE risk assessments for your patients? (Select all that apply)**

   ☐ Lack of time

   ☐ Limited knowledge or training on VTE

   ☐ Lack of confidence in performing VTE assessments

   ☐ Unavailability of assessment tools or resources

   ☐ High patient workload

   ☐ Lack of support from colleagues or supervisors

   ☐ Unclear guidelines or protocols for VTE risk assessment

   ☐ Belief that VTE risk assessment is unnecessary for some patients

   ☐ Other (please specify): _____

5. How would you rate the VTE risk assessment knowledge of other nurses in your unit?

☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

6. How sure are you that you can… ? (circle one number on each line)

	Never	Rarely	Sometimes	Often	Always
a. Conduct a thorough VTE risk assessment	1	2	3	4	5
b. Educate the patient on the proper use, potential side effects, and safety precautions of oral anticoagulants	1	2	3	4	5
c. Effectively use and appropriately fit mechanical devices for VTE prevention (e.g., graduated compression stockings or intermittent pneumatic compression)	1	2	3	4	5
d. Educate patients and their families about the signs and symptoms of DVT and PE, as well as the prevention and treatment options available	1	2	3	4	5
e. Advise and motivate at-risk patients to make lifestyle changes (e.g., weight loss, smoking cessation, and regular exercise)	1	2	3	4	5
f. Encourage early mobilization and leg exercises, particularly in at-risk patients such as post-surgical patients	1	2	3	4	5

7. **For each of the following risk factors, indicate whether you think they are *predisposing/genetic* factors (things you're born with) or *acquired/circumstantial* factors (things you develop due to certain conditions).**

Risk Factor	Predisposing/genetic factors	Acquired/ circumstantial factors
7a. Increasing age (>40 years)	BOTH	
7b. Obesity	☐	A
7c. History of smoking	☐	A
7d. History of VTE	☐	A
7e. Pregnancy/postpartum period	☐	A
7f. Cardiac or respiratory failure	☐	A
7g. Family history of VTE	P	☐
7h. History of cancer	☐	A
7i. Inflammatory bowel disease	☐	A
7j. Thrombophilia	P	☐
7k. Nephrotic syndrome	☐	A
7l. Major trauma	☐	A
7m. Immobility	☐	A
7n. Surgery	☐	A
7o. Cancer therapy	☐	A
7p. Spinal cord injury	☐	A

7q. Hospitalization	☐	A
7r. Acute medical illness (e.g., pneumonia, sepsis)	☐	A
7s. Central venous catheterization/pacemaker	☐	A
7t. Hormone replacement therapy	☐	A
7u. Estrogen-containing oral contraceptives	☐	A
7v. Varicose veins	☐	A
7w. Neurological disease with extremity paresis/paralysis	☐	A

8. **What are the signs and symptoms of deep vein thrombosis (DVT)**. Please check all that apply.

   Calf pain, tenderness ✔   Swelling ✔   Warmth ✔

   Groin swelling ✔   Erythema and discoloration ✔   Pitting oedema **NO**

   Dilated superficial veins ✔   Cyanosis ✔

9. **What are the signs and symptoms of pulmonary embolism (PE)**. Please check all that apply.

   Tachypnoea (>20 breaths/min) ✔   Tachycardia (>100 bpm) ✔   Dyspnoea ✔

   Pleuritic or chest pain ✔   Cyanosis ✔   Haemoptysis ✔

   Sudden collapse ✔   Cough ✔   Sweating ✔

10. **Indicate whether you think the following statements are "True" or "False":**

    a. Almost all patients admitted to the hospital are at risk for VTE.

       ✔ True   ☐ False

    b. Mechanical prophylaxis is as effective as pharmacological prophylaxis in preventing VTE.

       ☐ True   ✔ False

    c. A history of heparin-induced thrombocytopenia is a contraindication for VTE prophylaxis with heparin or low molecular weight heparin (e.g., enoxaparin).

       ✔ True   ☐ False

d. Recent surgery is a contraindication for using heparin or low molecular weight heparin for VTE prophylaxis.

☐ True ✔ False

e. Prophylaxis with heparin is absolutely contraindicated within 24 hours after neurosurgery.

✔ True ☐ False

f. A platelet count below 100,000 is a relative, not absolute, contraindication for heparin-based VTE prophylaxis.

✔ True ☐ False

g. A 35-year-old hospitalized patient with no significant medical history, admitted following a hernia repair, is still at risk for developing VTE.

✔ True ☐ False

h. Aspirin can be used as an effective alternative to heparin for pharmacologic VTE prophylaxis.

☐ True ✔ False

i. Enoxaparin has a lower incidence of heparin-induced thrombocytopenia compared to heparin, making it a preferable choice for VTE prophylaxis in certain cases.

✔ True ☐ False

j. Warfarin may interact with many other medications, such as aspirin and ibuprofen.

✔ True ☐ False

k. According to recent guidelines, rivaroxaban is one of the treatments given as a first line of treatment.

✔ True ☐ False

l. The WELLS score is only used to assess the pretest probability of a patient having a DVT, and not PE.

☐ True ✔ False

11. Which of the following is the initial diagnostic test of choice for DVT? (Choose one)

☐ D-dimer ☐ CT scan ✔ Ultrasound Doppler ☐ Impedance phlethysmography

☐ Venography ☐ MRI

12. Which of the following is the initial diagnostic test of choice for PE? (Choose one)

☐ Ultrasound Doppler ☐ V/Q scan (lung scan) ☐ D-dimer ✔ CT scan ☐ Pulmonary angiography

13. How much help did you receive in answering these questions? Please indicate below:

    a. Did you ask others for help with the answers?

       ☐ Yes

       ☐ No

    b. Did you look up the answers (e.g., using a computer, mobile phone or medical/nursing journal)?

       ☐ Yes

       ☐ No

Appendix D – Original Questionnaire with highlighted required changes

UCIMC Nurse Survey on Venous Thromboembolism (VTE)
Risk Assessment and Prevention
Survey Instrument - with Answer Key

Demographics:

1. **Age**:

   ☐ 18-25

   ☐ 26-35

   ☐ 36-45

   ☐ 46-55

   ☐ Above 56

2. **Gender**:

   ☐ Male

   ☐ Female

3. **Your highest level of education in nursing:**

   ☐ Associate Degree

   ☐ BSN

   ☐ MSN

   ☐ DNP

   ☐ PhD

4. **Length of time as an RN:**

   ☐ 6–12 months

   ☐ 1–3 years

   ☐ 4–6 years

   ☐ 7–10 years

   ☐ More than 10 years

5. Your current unit of work:

☐ Medical

☐ Surgical

☐ Orthopaedic

☐ Oncology

☐ Rehab

☐ ICU/CCU

☐ OBGYN

☐ ER/Urgent Care

☐ Other

6. Length of time as an RN in your current unit:

☐ 6–12 months

☐ 1–3 years

☐ 4–6 years

☐ 7–10 years

☐ More than 10 years

7. **Country where you completed your nursing education:**

☐ United States

☐ Other

Please answer the following questions by ticking (✓) the responses that best reflect your knowledge and practice.

1. **Have you ever attended a course or an in-service program that provided information on venous thromboembolism (VTE) risk assessment and prevention?**

   ☐ Yes   ☐ No

   a. **If yes, how would you rate the quality of the information provided in that programme?**

      ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

2. **How would you rate your overall knowledge of venous thromboembolism (VTE) risk assessment?**

   ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

3. **How frequently do you perform a VTE risk assessment on your patients?**

   ☐ Never   ☐ Rarely   ☐ For about half of my patients   ☐ For most of my patients

   ☐ For all of my patients

4. **What are the main barriers you encounter in providing VTE risk assessments for your patients? (Select all that apply)**

   ☐ Lack of time

   ☐ Limited knowledge or training on VTE

   ☐ Lack of confidence in performing VTE assessments

   ☐ Unavailability of assessment tools or resources

   ☐ High patient workload

   ☐ Lack of support from colleagues or supervisors

   ☐ Unclear guidelines or protocols for VTE risk assessment

   ☐ Belief that VTE risk assessment is unnecessary for some patients

   ☐ Other (please specify): _____

5. How would you rate the VTE risk assessment knowledge of other nurses in your unit?

☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

6. How sure are you that you can… ? (circle one number on each line)

	Never	Rarely	Sometimes	Often	Always
a. Conduct a thorough VTE risk assessment	1	2	3	4	5
b. Educate the patient on the proper use, potential side effects, and safety precautions of oral anticoagulants	1	2	3	4	5
c. Effectively use and appropriately fit mechanical devices for VTE prevention (e.g., graduated compression stockings or intermittent pneumatic compression)	1	2	3	4	5
d. Educate patients and their families about the signs and symptoms of DVT and PE, as well as the prevention and treatment options available	1	2	3	4	5
e. Advise and motivate at-risk patients to make lifestyle changes (e.g., weight loss, smoking cessation, and regular exercise)	1	2	3	4	5
f. Encourage early mobilization and leg exercises, particularly in at-risk patients such as post-surgical patients	1	2	3	4	5

7. For each of the following risk factors, indicate whether you think they are *predisposing/genetic* factors (things you're born with) or *acquired/circumstantial* factors (things you develop due to certain conditions).

Risk Factor	Predisposing/genetic factors	Acquired/ circumstantial factors
7a. Increasing age (>40 years)	BOTH	
7b. Obesity	□	A
7c. History of smoking	□	A
7d. History of VTE	□	A
7e. Pregnancy/postpartum period	□	A
7f. Cardiac or respiratory failure	□	A
7g. Family history of VTE	P	□
7h. History of cancer	□	A
7i. Inflammatory bowel disease	□	A
7j. Thrombophilia	P	□
7k. Nephrotic syndrome	□	A
7l. Major trauma	□	A
7m. Immobility	□	A
7n. Surgery	□	A
7o. Cancer therapy	□	A
7p. Spinal cord injury	□	A

7q. Hospitalization	☐	A
7r. Acute medical illness (e.g., pneumonia, sepsis)	☐	A
7s. Central venous catheterization/pacemaker	☐	A
7t. Hormone replacement therapy	☐	A
7u. Estrogen-containing oral contraceptives	☐	A
7v. Varicose veins	☐	A
7w. Neurological disease with extremity paresis/paralysis	☐	A

8. **What are the signs and symptoms of deep vein thrombosis (DVT)**. Please check all that apply.

Calf pain, tenderness ✔   Swelling ✔   Warmth ✔

Groin swelling ✔   Erythema and discoloration ✔   Pitting oedema **NO**

Dilated superficial veins ✔   Cyanosis ✔

9. **What are the signs and symptoms of pulmonary embolism (PE)**. Please check all that apply.

Tachypnoea (>20 breaths/min) ✔   Tachycardia (>100 bpm) ✔   Dyspnoea ✔

Pleuritic or chest pain ✔   Cyanosis ✔   Haemoptysis ✔

Sudden collapse ✔   Cough ✔   Sweating ✔

10. **Indicate whether you think the following statements are "True" or "False":**

a. Almost all patients admitted to the hospital are at risk for VTE.

   ✔ True   ☐ False

b. Mechanical prophylaxis is as effective as pharmacological prophylaxis in preventing VTE.

   ☐ True   ✔ False

c. A history of heparin-induced thrombocytopenia is a contraindication for VTE prophylaxis with heparin or low molecular weight heparin (e.g., enoxaparin).

   ✔ True   ☐ False

d. Recent surgery is a contraindication for using heparin or low molecular weight heparin for VTE prophylaxis.

☐ True   ✔ False

e. Prophylaxis with heparin is absolutely contraindicated within 24 hours after neurosurgery.

✔ True   ☐ False

f. A platelet count below 100,000 is a relative, not absolute, contraindication for heparin-based VTE prophylaxis.

✔ True   ☐ False

g. A 35-year-old hospitalized patient with no significant medical history, admitted following a hernia repair, is still at risk for developing VTE.

✔ True   ☐ False

h. Aspirin can be used as an effective alternative to heparin for pharmacologic VTE prophylaxis.

☐ True   ✔ False

i. Enoxaparin has a lower incidence of heparin-induced thrombocytopenia compared to heparin, making it a preferable choice for VTE prophylaxis in certain cases.

✔ True   ☐ False

j. Warfarin may interact with many other medications, such as aspirin and ibuprofen.

✔ True   ☐ False

k. According to recent guidelines, rivaroxaban is one of the treatments given as a first line of treatment.

✔ True   ☐ False

l. The WELLS score is only used to assess the pretest probability of a patient having a DVT, and not PE.

☐ True   ✔ False

11. Which of the following is the initial diagnostic test of choice for DVT? (Choose one)

☐ D-dimer   ☐ CT scan   ✔ Ultrasound Doppler   ☐ Impedance phlethysmography

☐ Venography   ☐ MRI

12. Which of the following is the initial diagnostic test of choice for PE? (Choose one)

☐ Ultrasound Doppler   ☐ V/Q scan (lung scan)   ☐ D-dimer   ✔ CT scan   ☐ Pulmonary angiography

13. How much help did you receive in answering these questions? Please indicate below:

    a. Did you ask others for help with the answers?

       ☐ Yes

       ☐ No

    b. Did you look up the answers (e.g., using a computer, mobile phone or medical/nursing journal)?

       ☐ Yes

       ☐ No

Appendix E – Questionnaire used in current study

An Evaluation of Critical Care Nurses' Perceived Knowledge and Practices of Venous Thromboembolism – Questionnaire

This questionnaire is adapted from Lee et al. (2014).

<u>Section 1: Demographic Data</u>

<u>Please answer the following questions by means of a tick (✓).</u>

1. **Age group**:

   ☐ 18-25   ☐ 26-35   ☐ 36-45   ☐ 46-55   ☐ Above 56

2. **Gender**:

   ☐ Male   ☐ Female

3. **Highest level of nursing education completed:**

   ☐ Diploma

   ☐ Bachelor's Degree

   ☐ Masters's Degree

   ☐ Doctoral Degree

4. **Total period of experience as a staff nurse:**

   ☐ 6–12 months

   ☐ 1–3 years

   ☐ 4–6 years

   ☐ 7–10 years

   ☐ More than 10 years

5. **Current unit of work:**

☐ Cardiac Critical Care Unit (CCCU)

☐ Cardiac Intensive Care Unit (CICU)

☐ Intensive Therapy Unit (ITU)

☐ Surgical High-Dependency Unit (SHDU)

6. **Total period of experience as a staff nurse in your current unit**:

☐ 6–12 months

☐ 1–3 years

☐ 4–6 years

☐ 7–10 years

☐ More than 10 years

7. **Country where you completed your nursing education:**

☐ Malta   ☐ Another EU country   ☐ Non-EU country

Section 2: Knowledge and Practice

Please answer the following questions by ticking (✓) the responses that best reflect your knowledge and practice.

1. **Have you ever attended a course or an in-service program that provided information on venous thromboembolism (VTE) risk assessment and prevention?**

   ☐ Yes   ☐ No

   a. **If yes, how would you rate the quality of the information provided in that programme?**

      ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

2. **How would you rate your overall knowledge of venous thromboembolism (VTE) risk assessment?**

   ☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

3. **How frequently do you perform a VTE risk assessment on your patients?**

   ☐ Never   ☐ Rarely   ☐ For about half of my patients   ☐ For most of my patients

   ☐ For all of my patients

4. **What are the main barriers you encounter in providing VTE risk assessments for your patients? (Select all that apply)**

   ☐ Lack of time

   ☐ Limited knowledge or training on VTE

   ☐ Lack of confidence in performing VTE assessments

   ☐ Unavailability of assessment tools or resources

   ☐ High patient workload

   ☐ Lack of support from colleagues or supervisors

   ☐ Unclear guidelines or protocols for VTE risk assessment

   ☐ Belief that VTE risk assessment is unnecessary for some patients

   ☐ Other (please specify): _____

5. How would you rate the VTE risk assessment knowledge of other nurses in your unit?

☐ Poor   ☐ Fair   ☐ Good   ☐ Very Good   ☐ Excellent

6. How sure are you that you can… ? (circle one number on each line)

	Never	Rarely	Sometimes	Often	Always
a. Conduct a thorough VTE risk assessment	1	2	3	4	5
b. Educate the patient on the proper use, potential side effects, and safety precautions of oral anticoagulants	1	2	3	4	5
c. Effectively use and appropriately fit mechanical devices for VTE prevention (e.g., graduated compression stockings or intermittent pneumatic compression)	1	2	3	4	5
d. Educate patients and their families about the signs and symptoms of DVT and PE, as well as the prevention and treatment options available	1	2	3	4	5
e. Advise and motivate at-risk patients to make lifestyle changes (e.g., weight loss, smoking cessation, and regular exercise)	1	2	3	4	5
f. Encourage early mobilisation and leg exercises, particularly in at-risk patients such as post-surgical patients	1	2	3	4	5

7. **For each of the following risk factors, indicate whether you think they are *predisposing/genetic* factors (things you're born with) or *acquired/circumstantial* factors (things you develop due to certain conditions).**

Risk Factor	Predisposing/genetic factors	Acquired/ circumstantial factors
Increasing age (>40 years)	☐	☐
Obesity	☐	☐
History of smoking	☐	☐
History of VTE	☐	☐
Pregnancy/postpartum period	☐	☐
Cardiac or respiratory failure	☐	☐
Family history of VTE	☐	☐
History of cancer	☐	☐
Inflammatory bowel disease	☐	☐
Thrombophilia	☐	☐
Nephrotic syndrome	☐	☐
Major trauma	☐	☐
Immobility	☐	☐
Surgery	☐	☐
Cancer therapy	☐	☐
Spinal cord injury	☐	☐

Hospitalisation	☐	☐
Acute medical illness (e.g., pneumonia, sepsis)	☐	☐
Central venous catheterisation/pacemaker	☐	☐
Hormone replacement therapy	☐	☐
Estrogen-containing oral contraceptives	☐	☐
Varicose veins	☐	☐
Neurological disease with extremity paresis/paralysis	☐	☐

8. **What are the signs and symptoms of deep vein thrombosis (DVT)**. Please check all that apply.

☐ Calf pain, tenderness   ☐ Swelling   ☐ Warmth

☐ Groin swelling   ☐ Erythema and discoloration   ☐ Pitting oedema

☐ Dilated superficial veins   ☐ Cyanosis

9. **What are the signs and symptoms of pulmonary embolism (PE)**. Please check all that apply.

☐ Tachypnoea (>20 breaths/min)   ☐ Tachycardia (>100 bpm)   ☐ Dyspnoea

☐ Pleuritic or chest pain   ☐ Cyanosis   ☐ Haemoptysis

☐ Sudden collapse   ☐ Cough   ☐ Sweating

10. **Indicate whether you think the following statements are "True" or "False":**

a. Almost all patients admitted to the hospital are at risk for VTE.

☐ True   ☐ False

b. Mechanical prophylaxis is as effective as pharmacological prophylaxis in preventing VTE.

☐ True   ☐ False

c. A history of heparin-induced thrombocytopenia is a contraindication for VTE prophylaxis with heparin or low molecular weight heparin (e.g., enoxaparin).

☐ True   ☐ False

d. Recent surgery is a contraindication for using heparin or low molecular weight heparin for VTE prophylaxis.

☐ True   ☐ False

e. Prophylaxis with heparin is absolutely contraindicated within 24 hours after neurosurgery.

☐ True   ☐ False

f. A platelet count below 100,000 is a relative, not absolute, contraindication for heparin-based VTE prophylaxis.

☐ True   ☐ False

g. A 35-year-old hospitalised patient with no significant medical history, admitted following a hernia repair, is still at risk for developing VTE.

☐ True   ☐ False

h. Aspirin can be used as an effective alternative to heparin for pharmacologic VTE prophylaxis.

☐ True   ☐ False

i. Enoxaparin has a lower incidence of heparin-induced thrombocytopenia compared to heparin, making it a preferable choice for VTE prophylaxis in certain cases.

☐ True   ☐ False

j. Warfarin may interact with many other medications, such as aspirin and ibuprofen.

☐ True   ☐ False

k. According to recent guidelines, rivaroxaban is one of the treatments given as a first line of treatment.

☐ True   ☐ False

l. The WELLS score is only used to assess the pretest probability of a patient having a DVT, and not PE.

☐ True   ☐ False

11. Which of the following is the initial diagnostic test of choice for DVT? (Choose one)

☐ D-dimer   ☐ CT scan   ☐ Ultrasound   ☐ MRI

Doppler

12. Which of the following is the initial diagnostic test of choice for PE? (Choose one)

☐ Ultrasound   ☐ V/Q scan   ☐ D-dimer   ☐ CT scan   ☐ Pulmonary

Doppler   (lung scan)   angiography

13. How much help did you receive in answering these questions? Please indicate below:

     a. Did you ask others for help with the answers?

        ☐ Yes

        ☐ No

     b. Did you look up the answers (e.g., using a computer, mobile phone or medical/nursing journal)?

        ☐ Yes

        ☐ No

Thank you for completing this questionnaire. Your time and effort are greatly appreciated!

Information Letter

Dear Participant,

My name is Martina Rizzo and I am currently reading for a Master of Science in Nursing (CriticalCare) at the University of Malta. As part of my course requirements, I am currently conducting a research study for my thesis entitled, "An Evaluation of Critical Care Nurses' Perceived Knowledge and Practices of Venous Thromboembolism" under the supervision of Dr. Adrienne Grech.

This study aims to evaluate the level of knowledge and practices among nurses working in critical care settings regarding the nursing care of venous thromboembolism (VTE), with a focus on understanding their proficiency in VTE prevention, risk assessment and overall patient care. Your participation in this study will provide valuable insights into VTE nursing care in high-risk settings, contributing to a better understanding of the educational and resource needs of nurses working in critical care environments. The survey that you have been invited to complete forms part of this study. This will take you approximately fifteen minutes to complete.

If you choose to participate, please note that there are no direct benefits to you and that there are no known or anticipated risks. Participation in this research study is completely voluntary and you are free to accept or refuse to take part without needing to give a reason. At no point will you be asked to provide your name or any other personal data that may lead to you being identified. Furthermore, you may skip any questions that you do not wish to answer. You are also free to withdraw from the study without needing to provide an explanation and without any negative repercussions. This is only possible until the submission of the questionnaire, after which point it will be impossible for data related to a specific participant to be identified, retrieved and deleted. The questionnaires will be distributed in blank envelopes that can be sealed. A designated collection box will be stored in the charge nurses' office. Once you have completed the questionnaire and sealed it in the envelope, you may place it into this box to ensure that your responses are collected securely and remained confidential. All anonymous

data collected will be placed in a locked file cabinet. Furthermore, any data collected from this survey shall be used solely for the purposes of this study.

Thank you for your time and consideration. Should you have any questions or concerns do not hesitate to contact myself or my supervisor on the details provided below.

Yours Sincerely,

Martina Rizzo

Dr. Adrienne Grech

Appendix G – Approval from Nursing Director

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Permission for study

Damato Carmela at MHA - MDH   3 December 2024 at 05:14
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>

Dear Ms. Rizzo

You have my approval Whilst Ii qish you the very best for your study.

Regards
Carmen

Sent from Outlook for iOS

Appendix H – Approval from CEO

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Study approval

CEO at MHA - MDH <ceo.mdh@gov.mt>
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>
Cc: CEO at MHA - MDH <ceo.mdh@gov.mt>

13 December 2024 at 15:43

Dear Ms Rizzo,

Your study entitled "***The Level of Knowledge and Practice among Nurses Working in Critical Care Settings Regarding the Nursing Care of Venous Thromboembolism***" is being approved on behalf of Ing. Keith Attard, CEO, Mater Dei Hospital.

Kindly make sure to ascertain that the guidelines provided by DPO are fully adhered to and ethical clearance is sought.

Good luck in your studies.

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24K

Appendix I – Approval from Chairperson of ITU

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Permission to recruit nurses from ITU

Azzopardi Godfrey at MHA - GGH
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>

7 December 2024 at 11:39

Dear Martina,

No objections from my end.

Kind regards,
Godfrey

Sent from Outlook for Android

Appendix J – Approval from Chairperson of SHDU

Permission to recruit nurses from SHDU

Caruana Clifford at MHA - MDH   2 December 2024 at 21:44
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>

No objection from my end. Please liase with charge nurses if surgical HDU

Sent from Outlook for Android

Appendix K – Approval from Chairperson of CCCU & CICU

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Permission to recruit nurses working in CCU and CICU

Cassar Maempel Andrew J at MHA - MDH   2 December 2024 at 18:15
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>
Cc: Chetcuti Quentin at MHA - MDH   , Deguara Alida at MHA - MDH

Hi Martina,
Please go ahead and good luck with your research. The NOs of the CCU are Alida and Quentin who are in copy.
Sincerely,
ACM

Sent from Outlook for Android

Appendix L – Clearance Letter from the Department of Surgery

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Request of DPA form

Young Sharon at MHA   7 January 2025 at 10:03
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>
Cc: Data Protection at MHA - MDH <datapro.mdh@gov.mt>, Data Protection Approval Form at MHA - MDH
<dpaform.mdh@gov.mt>

Ms Rizzo

No objection from my end if you extend your study with the Department of Surgery; as long as you abide by the subjoined
clearance conditions.

Regards

Sharon Young
Director General Informatics (Health)
Health Informatics Directorate

www.gov.mt | www.publicservice.gov.mt | fb.com/servizzpubbliku

Kindly consider your environmental responsibility before printing this e-mail

MINISTRY FOR HEALTH AND ACTIVE AGEING

MATER DEI HOSPITAL, TRIQ ID-DONATURI TAD-DEMM,
MSIDA, MALTA

Appendix M – Clearance Letter from DPO

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Request of DPA form

Data Protection at MHA - MDH <datapro.mdh@gov.mt>   7 December 2024 at 13:15
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>
Cc: Young Sharon at MHA   , Data Protection Approval Form at MHA - MDH <dpaform.mdh@gov.mt>

Ms Rizzo

On the basis of the documentation you submitted, from the MDH data protection point of view you have been cleared to proceed with your study titled **The Level of Knowledge and Practices among Nurses Working in Critical Care Settings Regarding the Nursing Care of Venous Thromboembolism** provided that you obtain approval from MDH CEO (ceo.mdh@gov.mt - please provide the relevant documents including Dr Godfrey Azzopardi, Dr Andrew Cassar Maempel and Ms Carmen D' Amato's approval with this email).

- Your intermediary to approach potential participants on your behalf to reply the anonymous self – administered paper-based questionnaire is *the Charge Nurse who works at the Intensive Therapy Unit and the Department of Cardiology, MDH respectively or his / her delegate*
- Your potential participants to reply the anonymous self-administered paper-based questionnaire are *Staff Nurses who work at the Intensive Therapy Unit and at the Department of Cardiology, MDH*

All data will be provided to you already anonymized given that Staff Nurses at the Cardiology Department and the Intensive Therapy Unit, MDH will reply to the anonymous, self-administered paper- based questionnaire.

Anonymisation, Data Minimisation and Implied Consent

For this study, consent is implied with affirmative action, meaning that if participants fill in the anonymous self-administered paper-based questionnaire, they will be consenting.

The identity of your potential participants cannot be divulged to anyone by your intermediaries not even to academic staff at UOM.

At no point you can be handed contact details of potential participants given that **they will be approached by the Charge Nurse or his / her delegate in your absence**.

All your participants must be reached and approached for invitation by the Charge Nurse or his / her delegate when physically at the Intensive Therapy Unit / Department of Cardiology, MDH and <u>NOT</u> via postal services, email, telephony or any other means. You cannot be handed any contact details of potential participants, otherwise consent would be bypassed.

This clearance does not allow you to communicate with potential / participants given that they will only be approached by the Charge Nurse or his / her delegate.

Please communicate with the Intensive Therapy Unit and the Department of Cardiology Charge Nurse to present this clearance email.

This clearance <mark>does not</mark> cover and research activity taking place at the Department of <mark>Surgery</mark>.

To sign the data protection form, please contact Ms Graziella Aquilina through dpaform.mdh@gov.mt to provide the following:

1. *This clearance email in PDF – to provide in PDF*
2. *MDH CEO's approval in PDF – pending*
3. *The name of the Chairperson and Director who approved your research – Dr Godfrey Azzopardi, Dr Andrew Cassar Maempel and Ms Carmen D' Amato*
4. *The period of data collection – December 2024 (after you sign the Data Protection form) – February 2025*
5. *Title of your research - The Level of Knowledge and Practices among Nurses Working in Critical Care Settings Regarding the Nursing Care of Venous Thromboembolism*
6. *Your ID number – 418399 (M)*

NB: You must sign this form before starting. You will receive an email from adobe sign to sign electronically.

In summary – next step

1. Obtain approval from MDH CEO through ceo.mdh@gov.mt
2. Sign the Data Protection form at Ms Graziella Aquilina through dpaform.mdh@gov.mt (please provide the above six points)

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image001.jpg
24K

Appendix N – Permission to use tool

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Request for permission

Lee, Jung Ah   11 November 2024 at 21:25
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>

Dear Martina Rizzo,

Please find attached survey questionnaire with answer key.

I used 2008 ACCP guidelines to develop questions. You may like to check the most recent ACCP VTE prevention and treatment guidelines. The true/false questions appeared to be hard for nurses to answer. You can feel free to modify some questions relevant to context to the clinical guidelines that your country uses. You may like to have a clinician as a member of your advisement team for your master's dissertation to comment and support the most relevant information toward content.

Please also feel free to let me know if you have any further questions.

Hope your study is going well.

Sincerely,

Jung-Ah Lee

JUNG-AH LEE, PhD, RN, FGSA, FAAN, FADLN (she/her/hers)

Professor | Associate Dean for Diversity, Equity, Inclusion, and Belonging

PhD Program Director

Sue & Bill Gross School of Nursing

University of California, Irvine

Nursing & Health Sciences Hall, Office 4305

854 Health Sciences Rd

Irvine, CA 92697-3959

| nursing.uci.edu

UCI IRB Survey Instrument_answerKey.doc
86K

Appendix O – Approval of amendment of title

L-Università ta' Malta

Martina Rizzo <martina.rizzo.17@um.edu.mt>

Request for amendment of title

Marthese Gauci   28 March 2025 at 14:17
To: Martina Rizzo <martina.rizzo.17@um.edu.mt>

Dear Martina,

Kindly note that your request to change your dissertation title to: An Evaluation of Critical Care Nurses' Perceived Knowledge and Practices of Venous Thromboembolism has been approved by the Faculty Board.

Thanks and Regards

Marthese

L-Università ta' Malta

Marthese Gauci | Administrator

Faculty of Health Sciences
Office of the Dean
Department of Nursing
Room 4, Block A, Level 1,
Mater Dei Hospital, Imsida

*The contents of this email are subject to **these terms**.*

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