

Master of Clinical Science

Venous Thromboembolism (VTE) Risk Assessment and Prophylaxis: A Comprehensive Systematic Review of the Facilitators and Barriers to Healthcare Worker Compliance with Clinical Practice Guidelines in the acute care setting

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Abstract

Background: Even though guidelines for venous thromboembolism (VTE) risk assessment and prophylaxis are available, patients with identifiable risk factors admitted to acute hospitals are not receiving appropriate prophylaxis. The incidence of VTE in hospitalised patients is higher than that of people living in the community who have similar demographics. Knowledge of barriers to clinician compliance with clinical practice guidelines and facilitators to improve compliance will aid appropriate use of VTE clinical practice guidelines.

Objectives: The objective of this review was to identify the barriers and facilitators to healthcare professional compliance with clinical practice guidelines for VTE assessment and prophylaxis.

Inclusion criteria

Types of participants: Studies were considered for inclusion regardless of the designation of the healthcare professional involved in the acute care setting.

Focus of the review: The focus of the review was compliance with VTE clinical practice guidelines and identified facilitators and barriers to clinical use of these guidelines in the acute care setting.

Types of studies: Any experimental, observational studies or qualitative research studies evaluating healthcare professional compliance with clinical practice guidelines were considered for inclusion in this review.

Types of outcomes: The outcomes of interest were percentage of compliance with VTE guidelines and identified barriers and facilitators to that compliance.

Search strategy: A comprehensive, three-step search strategy was conducted for studies published from May 2003 to November 2011 due to a previous systematic review that overlaps this one, and aimed to identify both published and unpublished studies in the English language across six major databases (PubMed/MEDLINE, CINAHL, EMBASE, Scopus, ProQuest & MedNar).

Methodological quality: Retrieved papers were assessed by two independent reviewers prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute. The critical appraisal tools used were MASTARI for the quantitative studies and QARI for the qualitative studies. There were no disagreements between the two reviewers.

Data collection: Both quantitative and qualitative data was extracted from included papers using the standardised data extraction tools MASTARI and QARI from the Joanna Briggs Institute.

Data synthesis: Quantitative data was pooled using narrative summary due to heterogeneity in the ways in which data was reported, using quasi-experimental pre and post studies, cohort study and descriptive/case series. Qualitative data was pooled using Joanna Briggs Institute QARI data synthesis

tool.

Results: In total, twenty studies were included in the review, eighteen quantitative and two qualitative with methodological quality ranging from low to high using the Joanna Briggs Institute appraisal tools MASTARI and QARI.

The lowest and highest reported compliance in the quantitative studies at baseline ranged from 6.25% to 70.4% and compliance post intervention ranged from 36% to 100%. Six of the twenty studies included multiple healthcare professionals in the study and of these only one compared the percentage of compliance between the groups. That study acknowledged that due to the variation of improvement between mechanical and pharmacological prophylaxis, and since nursing staff were responsible for mechanical and medical staff for pharmacological that the intervention was more effective for medical staff.

Nine main categories of barriers and nine main categories of facilitators to VTE guideline compliance were identified. Similar barriers and facilitators were highlighted by the quantitative and qualitative studies. The studies all had components of education as an intervention and this review found that passive dissemination or a single mode of intervention was not sufficient to affect and sustain change in clinical practice. The main barriers identified were 'lack of attention' and lack of awareness', with the main facilitator being 'education'.

Conclusions: This review identified eighteen quantitative studies and two qualitative studies that assessed compliance with VTE clinical practice guidelines, and identified barriers and facilitators to that compliance. The studies showed that many different forms of intervention can improve compliance with clinical practice guidelines. Interventions can be developed for the specific audience and setting they are being used for, keeping in mind that not all interventions are appropriate for all areas, such as computer applications not being suitable where system capacity is lacking.

Implications for practice: Healthcare professionals need to be aware of VTE clinical practice guidelines and improve patient outcomes by using them in the hospital setting. There are a number of interventions that can improve guideline compliance keeping in mind the barriers and adjusting practice to minimise them.

Implications for research: Venous thromboembolism compliance within rural hospital settings has not been determined, however as inequalities have been identified in other areas of healthcare between urban and rural regions this would be a logical area to research. Furthermore, the sustainability and cost effectiveness of VTE compliance programs should also be examined.

Student Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Sherryl Gaston and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or any other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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23/01/2013

List of Abbreviations

ACCP	American College of Chest Physicians
AHRQ	Agency for Healthcare Research and Quality
AOR	Adjusted Odds Ratio
CI	Confidence Interval
COPE	Computerized prescriber order entry
DVT	Deep Vein Thrombosis
EBP	Evidence-based practice
EOV	Educational outreach visit
JBI	The Joanna Briggs Institute
LDUH	Low-dose unfractionated heparin
LMWH	Low molecular weight heparin
LOS	Length of Stay
MAStARI	Meta Analysis of Statistics Assessment and Review Instrument
NHMRC	National Health and Medical Research Council
NICE	National Institute for Clinical Excellence
NOTARI	Narrative, Opinion and Text Assessment and Review Instrument
NS	Not significant
PA	Physician Assistant
PE	Pulmonary Embolism
QARI	Qualitative Assessment and Review Instrument
RAM	Risk assessment model
SEBMO	Standardised evidence-based medical orders
SMPU	Safe medication Practice Unit
UK	United Kingdom
USA	United States of America
VTE	Venous Thromboembolism

Chapter 1: Introduction

1.1 Situating the review

This study examines the literature on health professional's compliance with VTE clinical practice guidelines, and identifies the barriers and facilitators to that compliance in the acute healthcare setting. My interest in this area relates to a project completed in a rural acute care hospital for a clinical fellowship with the Joanna Briggs Institute that investigated rural nurse's knowledge around VTE risk assessment and prophylaxis.

The National Health and Medical Research Council (NHMRC) state that, '*The incidence of VTE as a complication of hospital admission is commonly underestimated. There is good evidence that VTE prophylaxis measures continue to be under-utilised or used sub-optimally*'.⁽¹⁾ The National Institute of Clinical Studies have estimated that about 2,000 people die as a result of VTE each year with about 30,000 being hospitalised.⁽¹⁾ Of the 2,000 deaths, many are potentially preventable through appropriate risk assessment and the corresponding use of measures like anti-embolic stockings, or antithrombotic drugs.⁽¹⁾

Clinical practice guidelines are described as tools that healthcare workers use to improve patient care with recognised standards to guide decisions.⁽²⁾ These tools are generally developed following a review of available evidence in association with clinical experts.⁽²⁾

The optimal way to prevent VTE in the acute setting is to undertake a risk assessment on all adult patients as they are admitted.^(1, 3) and then provide prophylaxis in accordance with that assessment.⁽⁴⁾ A risk assessment is a tool that is used to identify indicators of potential risks using standard criteria.⁽⁵⁾ It can be used to systematically assess a person's level of risk when they are admitted to hospital.⁽⁵⁾ The risk assessment used on hospital patients are developed from the national guidelines and is usually a scoring system to assess the patients risk factors where points are given for specific risks.⁽⁶⁾ The points are assigned to each risk factor in relation to the amount they contribute to the risk.⁽⁶⁾ Once the risks have been identified the score is calculated giving an overall risk score.⁽⁶⁾ The risk assessment form will generally identify guidelines of what prophylaxis should be initiated for different risk factors; these vary slightly in different facilities however they are basically the same.⁽⁶⁾ The only time prophylaxis will not be used is when there is a contraindication and this will be assessed on an individual basis.⁽⁶⁾

The incidence of VTE has been identified as being greater in hospitalised patients than those living in the community who are the same age, and is as much as 100 times higher.⁽¹⁾ A multinational study to investigate the use of prophylaxis for patients that had risk factors for VTE was undertaken.⁽³⁾ The findings of this study identified that across the world there were a substantial number of hospitalised people at risk of developing VTE, and that prophylaxis recommended for their risk factor/s were not adequately utilized.⁽³⁾

1.2 Structure of the thesis

The thesis comprises nine chapters. Chapter 1 presents the introduction to the study and its objective. The methods utilized in the study are presented in Chapter 2. Chapter 3 contextualizes the results with a description of the studies and methodological quality with the systematic review process adhered to by the Joanna Briggs Institute. Chapter 4 presents the main findings from the individual studies. Chapter 5 is the synthesised evidence generated from the analysis identifying the barriers and facilitators to compliance with clinical practice guidelines. Chapter 6 provides the discussion of each theme and synthesis and identifies the healthcare professionals involved in the studies, their location as well as the types of study designs and interventions utilized. Chapter 7 summarises the study and, based on the synthesis, suggests areas for future research. Chapter 8 is the reference list and Chapter 9 lists the appendices.

1.3 Systematic reviews in historical context

Searching for studies and summarising the findings of those on the same topic using similar methods in a systematic review or knowledge synthesis has been happening from many decades.⁽⁷⁾ The popularity of general reviews increased in the 1960s especially in the areas of social science, psychology and education.⁽⁷⁾ It has been recognized that evidence-based decision making in healthcare is important and has increased in popularity with both researchers and healthcare professionals.⁽⁷⁾ There are a variety of different structures that can be used to review literature that are currently available and fourteen of the formats used most often in the healthcare area have been discussed in a recent paper.⁽⁸⁾

Historically randomized controlled trials were the only evidence that was deemed of any significance when assessing intervention effectiveness. Other designs of study like descriptive or quasi-experimental as forms of evidence additional to quantitative were then accepted.⁽⁹⁾ Due to these forms of studies not

encompassing the complete picture organisations like the Joanna Briggs Institute and the Cochrane collaboration began to consider qualitative studies where patients or healthcare professional's experiences became accepted as evidence. The notion of what establishes evidence widened and therefore the need to broaden the methods of combining this evidence also transformed.⁽⁹⁾

When the concept of research was in its infancy, experts in a field would study research a particular concern or question and then summarise the findings into a conclusion to identify if a treatment was effective or ineffective.^(7, 10, 11) This model of review was generally referred to as a literature review or narrative review and frequently offered minimal information on how the evidence was collected, judged and summarised.⁽⁸⁾ However when using this form of literature review it is difficult for healthcare professionals to make judgements on what are appropriate to use for support in clinical guideline development.⁽¹²⁾ Literature reviews may use inappropriate methods to research the evidence however as it is not identified in the summarised findings the clinician is not able to judge this.⁽¹²⁾ There may be poor standards of statistical analysis in the individual studies used, or the sample size may make the research findings inconclusive therefore if it is not identified it may be inadequate to support practice change.⁽¹²⁾ Systematic reviews have become progressively important over the years due to the process they use to collect the results, by selecting studies using developed criteria, appraising the extracted data using developed data extraction and appraisal tools and then synthesizing the findings with clear guidelines for their development healthcare professionals can be confident the evidence is valid.⁽¹²⁾

1.4 Overview of the science of evidence synthesis in healthcare

Evidence is defined as information indicating beliefs or hypothesis, are true or valid and is 'the language of science where we communicate true facts that are derived from the component elements of true knowledge, namely:

- Knowledge from research (refined data or evidence)
- Knowledge of measurement (statistical methodology)
- Knowledge from experience (judgements and decision)
- Knowledge of practice (leadership and management)^(9) p.2)

Evidence synthesis is an umbrella term used to determine a technique that incorporates information from different sources to provide the best evidence in a particular area of healthcare.^(9, 13) By synthesizing evidence into a single document, healthcare professionals are able to offer a more comprehensive foundation for evidence based healthcare rather than utilizing a single study.^(9, 13) The systematic review is a form of data synthesis that can combine quantitative and qualitative studies in an

effective manner.⁽¹³⁾ It assesses the quality of each study individually to identify the level of the synthesized results.⁽¹³⁾ The Joanna Briggs Institute defines the 'core of evidence synthesis as, the systematic review of literature of a particular intervention, condition or issue'.⁽¹⁴⁾ A systematic review is where knowledge is used to communicate facts and refine data that provides the best evidence for practice.⁽¹³⁾ The systematic review is where available evidence is analysed and from the analysis the effectiveness of the practice is identified using criteria to judge the information provided.⁽¹⁴⁾ Evidence synthesis uses two techniques to improve the process of accumulation of the evidence which are statistical hypothesis testing and exploratory data analysis.^(9, 13, 15) The first provides the method that is used to accept or deny a hypothesis by using statistics, while the second appraises the data to present a research hypothesis for evaluation.⁽¹³⁾ There are a variety of studies on specific topics which can provide agreement and disagreement between them, evidence synthesis is a way to integrate the findings of multiple studies in an identified area into understandable outcomes.⁽¹³⁾

In systematic reviews evidence synthesis uses predefined criteria to assess the methodological quality of the studies being evaluated.⁽⁹⁾ There is no single set of criteria used when undertaking critical appraisal, however there is a guiding set of principles.⁽¹³⁾ Even though the strength of the quality of the studies are important it is also important to assess the methodology used in the study, as different methodologies are gauged as having different levels of validity.^(9, 12) There is international consensus on a hierarchy of evidence being used in evidence synthesis. For quantitative evidence randomised control trials are at the top of the pyramid of and non-experimental/descriptive evidence being at higher risk of bias and therefore considered to be the lowest level.⁽¹³⁾ Systematic reviews that appraise and synthesise multiple randomised trials are considered to be one of the highest levels of evidence and therefore an excellent source with which to inform policy and practice.⁽¹³⁾

Synthesizing qualitative evidence is about analysing and interpreting the data from the primary study.⁽¹⁶⁾ To be able to ensure the interpretation is credible, dependable and transferable the methodology used for the interpretation and synthesis needs to be valid and transparent.⁽¹⁶⁾ Synthesizing the findings of a number of research studies attempts to establish connections between them in relation to a specific topic or phenomenon and provide integrated results.⁽¹⁶⁾ There are two main approaches when synthesizing qualitative data, one is interpretive and the other is aggregative.⁽¹⁶⁾

The interpretive approach is where the researcher explains what they read and this can be affected by their own history, prior understanding, background and the context the study is in.⁽¹⁶⁾ The participants interpret the study with their own background influencing their perception and once reported those who read it will interpret it with the influences in their lives providing another interpretation of the initial

study.⁽¹⁶⁾ Due to the researchers, readers and participants interpreting a study with their own background influences multiple interpretations of the topic can result.⁽¹⁶⁾

Qualitative research is used to identify the human experience and discusses how people define their surroundings.⁽¹⁶⁾ This is influenced by the experiences that occur between them and others, how they think others identify them, the amount of control they feel they have and how important this control is to them, and the different ways they have learnt to address experiences throughout their lives.⁽¹⁶⁾ There are two main approaches used in the synthesis of qualitative evidence – interpretative and aggregative. This study took the aggregative approach to the synthesis of qualitative findings.

Aggregative also known as meta-aggregation is essentially interpretive however it ensures the interpretive method used is precise.⁽¹⁶⁾ Meta-aggregation uses the process of gathering the findings from studies which could be concepts, themes, categories or metaphors and group these findings based on similarity of meanings.⁽¹⁶⁾ Aggregation facilitates the process to produce theories of connectedness, as well as generalizing the claims, and identifying the shared meaning.⁽¹⁶⁾ Meta-aggregation uses methods of interpretative steps that are transparent for all to identify.⁽¹⁶⁾

Meta-aggregation uses a process approach which is structured when employed to synthesize research findings that are qualitative.⁽¹⁶⁾ Any systematic review that uses meta-aggregation utilizes a structured process that is similar.⁽¹⁶⁾ This form of synthesis follows a rigorous process that begins with the development of the protocol or proposal and within this is the question that is to be explored, the criteria to be used to identify appropriate literature to include in the review, how that literature is to be searched for and what timeframe this literature will fit within.⁽¹⁶⁾ Once the studies have been identified for inclusion they undergo a critical appraisal and then the findings are extracted to meet the question developed for the review, these findings are then combined.⁽¹⁶⁾

Quantitative data can be presented using two different forms, numerical data is a way of describing a means or average and categorical data provided a way to present proportions or percentages.⁽¹⁷⁾ Combining multiple studies in a systematic review using a meta-analysis it can strengthen the statistical ability of these studies by providing one outcome rather than multiple small ones.⁽¹⁷⁾ The diversity or heterogeneity of studies included is important to identify, although there will possibly be some variation with the different studies, assessing that there is a similarity between the studies will provide evidence that they are suitable to be combined.⁽¹⁷⁾ A meta-analysis is where an overall summary result is

provided by combining the statistical findings from individual studies together, and they can be utilized to increase the power to identify any statistical variations.⁽¹⁵⁾

Even though qualitative and quantitative research take different approaches to research questions, they can complement one another.⁽¹⁸⁾ All researchers use a systematic approach when collecting and analysing data and examining the patterns to either explain or understand something.⁽¹⁸⁾ The difference between qualitative and quantitative data arises from the character of the collected data. There is so-called soft data which is collected in the structure of words, photos, sentences, impressions and then there is hard data which is collected using numbers.⁽¹⁸⁾ These differences in data can cause the tools used in one form of data collection to be inappropriate or unconnected to the other.⁽¹⁸⁾ Qualitative data cannot be judged by the standards used to judge quantitative and vice versa.⁽¹⁸⁾ Quantitative research is measured precisely and identifies variables and tests hypotheses to explain a concept or relationships between variables.⁽¹⁸⁾ Even though these two styles are quite different and use different tools to collect the data they can complement each other.⁽¹⁸⁾ A qualitative review alone could encounter problems such as identifying multiple viewpoints that were not agreeing with each other, and a quantitative review may provide statistical data but no evidence of the relationship between the variables in human terms.⁽¹⁵⁾

It can be useful to be able to undertake a systematic review that includes both qualitative and quantitative evidence as it provides not only information on the effectiveness of an intervention but also the experiences and context of the participants of the intervention. The reason this review has been represented as a comprehensive systematic review was to be able to provide percentages of compliance with VTE clinical practice guidelines, and the barriers and facilitators the researchers identified, but also to identify what individual participants felt the barriers and facilitators were and give meaning to them in real terms.

Researchers that use a mixed method of comprehensive approach, consider studies that address a topic informed by both quantitative and qualitative studies.⁽¹⁶⁾ The difference between these two approaches is that the mixed method combines the qualitative and quantitative data throughout the process and the comprehensive approach keeps the two types of evidence separate until the discussion section. The present study used a comprehensive approach.

In the early years of mixed methods, researchers acknowledged that different methods have limitations and they felt that any biases in one method could counteract the biases of another.⁽¹⁶⁾ This then moved to cross examination of the data generally using three different methods to provide a valid outcome to

the findings and improve credibility of the results, and can be used for both qualitative and quantitative studies.⁽¹⁶⁾ This thought of merging the methods then moved to incorporating or linking the qualitative and quantitative studies.⁽¹⁶⁾ By using this method the information identified in one mode could inform the direction or participants in another, or it could support the findings of the other.⁽¹⁶⁾ Using both qualitative and quantitative studies the data could either be used to reinforce each other or could be used side by side in providing the findings.⁽¹⁶⁾

To complete an evidence synthesis there is knowledge appraised from the study design, the quality of the studies included, if there were any gaps in the research, what the trends were with time lines, the effect size, if there was any variability in the populations used in the study, was there an impact of covariates adjustment, and finally what the quantification of the research heterogeneity was.⁽¹³⁾ To achieve and assess all of these aspects the studies are weighted using set classifications to provide an accurate comparison.⁽¹³⁾ By undertaking evidence synthesis in this way it allows the researcher to provide best evidence based outcomes.⁽¹³⁾ Checklists and tools have been developed by different organisations to assist with assessing studies, with the Joanna Briggs Institute qualitative one being Qualitative Assessment and Review Instrument (JBI-QARI), and a quantitative one being Meta Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix II).⁽¹⁶⁾ Whether a study is included in the review or not can be decided after using these critical appraisal tools to determine how they meet the pre-determined criteria.⁽¹⁶⁾ With a meta-analysis the data that is combined only comes from studies that used the same method to generate the findings, however with meta aggregation data that is similar can be put into groups and therefore different study methods can be used.⁽¹⁶⁾

1.5 What are systematic reviews?

A systematic review is a way to combine multiple studies on the same subject and provide a summary of the outcomes.⁽¹⁹⁾ This allows health professionals to go to one source on an area of interest to identify relevant information, rather than search multiple single sources without using a system to compare and synthesize the information.⁽¹⁹⁾ By conducting a systematic review the author uses a systematic approach to identify appropriate research studies and text opinion.^(13, 19) They will identify studies in the relevant field and then select the ones appropriate to the review by using pre-defined criteria and assessing which studies meet the criteria.^(13, 19) Once the studies have been identified they are then assessed for quality using an appraisal tool that will assist the researcher identify if the studies are of low, medium or high quality, and then the findings are extracted and classified.^(13, 19) The findings are then interpreted and presented in a summarised report with limitations and benefits identified.^(13, 19) A systematic review is not limited to the type of study as they are able to assess and analyse both

qualitative and quantitative studies, with the convenience of being able to combine both in a single review.⁽¹³⁾ For example by using both qualitative methods with a randomised controlled trial the reviewer will be able to present a more complete picture on the aspect being reviewed such as the statistics of use of an intervention as well as how participants feel about the way it works.⁽¹⁹⁾

Although there are several definitions of what a systematic review is, commonly agreed upon criteria are that it will summarize all of the research available on the topic, that the principles used are quite rigorous and systematic in its approach, that the methods used are documented in the systematic review protocol at the pre-planning stage as well as in the final review report.^(12, 16) Another important process is to develop an *a priori* protocol which will define the objectives and methods that are going to be used in the systematic review, this protocol allows the reader to identify how the findings and outcomes with recommendations were classified, in a systematic way and provides transparency of the process.⁽¹⁶⁾

A systematic review will critically appraise each study that is included and combine the results to provide a summary of the statistics or findings.⁽¹³⁾ It will also identify if there were any discrepancies between the studies and discuss reasons as well as if they were methodologically unsatisfactory, which will then lead to the determination of potential future areas for research.⁽¹³⁾

1.5.1 Systematic Review's in guideline development

Traditionally clinical policies were the responsibility of individuals with knowledge and experience in a particular field.⁽²⁰⁾ Passive dissemination of evidence using peer reviewed journals was not a successful way to inform healthcare professionals about changes in practice.⁽²⁰⁾ However a systematically developed clinical practice guideline introduced to a clinical practice workplace was determined to be a more effective way to create awareness and inform clinical practice.⁽²⁰⁾ Most clinical guidelines are a combination of research evidence, clinical experience and expert opinion.⁽²⁰⁾ Those who are responsible for developing clinical practice guidelines are finding it more important to include research evidence and due to this there are increased challenges due to the exhaustive range of primary research available.⁽²⁰⁾ Due to the difficulties in locating and appraising evidence within time constraints, as well as the knowledge and ability to source all appropriate studies a systematic review can provide a high quality foundation for those guideline developers.⁽²⁰⁾ Systematic reviews are the most widespread source of combined articles and their authors have searched for all articles on a topic, they have selected those appropriate by using identified criteria and then they have synthesized the findings into one resource. This therefore provides those developing clinical practice guidelines an alternative to summarizing

primary research themselves by utilizing a systematic review that has provided a summary of relevant studies on a specific topic.⁽²⁰⁾

Not only are systematic reviews used to develop clinical practice and cost effectiveness in healthcare systems, they are also used to assess the effectiveness of an intervention or medication.⁽¹⁹⁾ Systematic reviews are used to identify future areas needing research as well as assisting researchers to secure funding.^(15, 19) Systematic reviews are used by students as part of their post graduate thesis, and in areas where there may be several primary studies where there is no clear answer or outcome.⁽¹⁹⁾

In 1992 there was a publication of two papers that reported overwhelming findings.⁽¹⁹⁾ The first paper stated that if initial studies related to heart attacks and clot busters had been systematically reviewed it would have been apparent in the mid-1970's that there were benefits to the therapies.⁽¹⁹⁾ The second paper stated that 'narrative reviews were woefully inadequate in summarising the current state of knowledge', however these reviews either proposed that treatments should be part of the ongoing investigation, or neglected to state the effective therapies.⁽¹⁹⁾

1.5.2 How do systematic reviews compare with traditional literature reviews?

To produce a systematic review there needs to be thoroughness in its development.⁽¹⁹⁾ When publishing a systematic review the approach taken in its development needs to be explained to provide those who may use it to change or modify clinical practice an ability to assess its validity and any potential biases.⁽¹⁹⁾ By using peer review processes when seeking to publish a systematic review provides an optimal way to ensure it is valid and of high quality. ⁽¹⁹⁾ The traditional literature reviews are not as rigorous in their review and generally lack critical information in the research, inclusion criteria, appraisal, data extraction and synthesis of the data. See Table 1 for an overview of the differences between a systematic review and a literature review.^(12, 19, 21)

Table 1 Main differences between a systematic review and a literature review

	Systematic Review	Literature Review
Title	The title contains precise description related to the PICO (Participants, Intervention or phenomenon of interest, Comparator(s) and Outcomes). It has a clear hypothesis to be tested or question to be answered.	Generally there is no hypothesis and even if there is question to start with there will generally be a discussion about what is known about the subject.

Search Strategy	Identify ALL evidence that may be relevant from published and unpublished sources.	Can lead to selective studies being chosen to support their views rather than including all resources. Not always specific about how the studies were selected.
Inclusion Criteria	There is a defined criteria which identifies which studies will be included.	There is usually no specific criteria identified for the reason to include studies.
Critical Appraisal	The quality of each study or report is assessed in a transparent way and it is clearly defined how studies will be either included or excluded in the review.	There are usually no specific identification about how the studies were assessed, appraised or included/excluded in the review.
Data Extraction	There is a predefined way that the data is extracted and this is consistent with the outcome measures. There is the use of standardised tools or checklists to extract the data.	There is usually no identification of the method used to extract the data or use of tools or checklists.
Data Synthesis	It is identified how the data will be reviewed and details are provided about how the data is to be combined. The findings are interpreted and then presented in an impartial and unbiased way taking into account any limitations in the evidence. Able to be replicated if necessary.	Not always specific about how the studies were interpreted or integrated into the findings. Synthesis is not always rigorous which can lead to bias. Different reviewers sometimes arrive at different conclusions with the same information source therefore not always able to be replicated
General	Thoroughness in the review can be equal to or greater than the rigour of the original research. Led by <i>a priori</i> and/or approved protocol.	Lack of rigour providing gaps in the outcomes of the review. No peer reviewed protocol.

The process of producing a systematic review has several steps that are needed to ensure an appropriate method has been used.^(12, 19) The first step is to develop a protocol which is similar to a research proposal and outlines in detail, each step that is to be undertaken in the review such as what the review question is to be, how the studies will be chosen for inclusion, how they will be appraised and then the findings synthesized.⁽¹²⁾

Systematic reviews are used to answer a question instead of summarise the literature that is found on a particular topic that may be of interest.⁽¹²⁾ The review question should be written specific to the population that are going to be explored, should identify the intervention that is to be assessed, explain what the comparison or control is going to be examined and what outcome is expected.⁽¹²⁾ The question should be clear and it should provide direction for the review.⁽¹²⁾

Once the question has been defined there needs to be a clear objective for the systematic review with the groups to be involved identified.^(12, 19) This needs to include the setting and the types of evidence that will be used to assist in answering the question as well as anticipated outcomes.⁽¹⁹⁾ These items are needed for the reviewer to be able to select which studies meet the requirements needed to be included in the review.^(12, 19)

There should be a systematic search of the literature using the criteria developed to select studies appropriate to the question and objectives.⁽¹²⁾ This needs to be a comprehensive search of unpublished as well as published literature to identify all studies relevant to meet the systematic review objectives.⁽¹⁹⁾ All the literature needs to be searched to provide an un-biased end product.⁽¹²⁾ There are databases and search engines that have been developed to assist the reviewer to identify potential studies.⁽¹⁹⁾ A three step search strategy is optimal to use with the initial search of the general literature to identify existing reviews, identify what key terms should be used and define which databases should be used.⁽¹²⁾ The second step is to search all of the databases using the key terms that were identified in the first step and using the inclusion criteria that was developed to identify which studies should be included.⁽¹²⁾ The third step is to examine the papers and studies collected in steps one and two to identify any other potential studies from their reference list and bibliographies.^(12, 19)

There needs to be an assessment of the studies against the inclusion criteria to evaluate their eligibility.⁽¹²⁾ Once it is identified which studies meet the inclusion criteria the full text of the studies needs to be retrieved.⁽¹⁹⁾ Once the full article is retrieved, using a critical appraisal framework' the

methodological quality is evaluated and a further decision of which studies to include is undertaken.^(12, 19) The appraisal of the methodological quality of the studies leads the reviewer to be able to identify if the methods of the research as well as the results are valid.⁽¹²⁾ Any studies excluded at this point are identified in the systematic review with reasons for the exclusion.⁽¹⁹⁾ The studies that are to be included will then have the data extracted using a formal process which leads to the creation of the list of included studies.⁽¹⁹⁾

Data is collected using data collection tools, this strategy ensures that all relevant data is collected, that errors in transcribing information is reduced, records the data collected as well as reduces errors to ensure the accuracy of information is of high standard.⁽¹²⁾ The findings from the individual studies are synthesized into combined results that will identify the viability, clinical efficiency and suitability of the activity or intervention being researched.^(12, 19) Combining the information in this manner is labelled 'evidence synthesis' and depending on the type of data collected will drive what form of 'evidence synthesis' is used.⁽¹⁹⁾ There will generally be a meta-analysis conducted for quantitative evidence with a meta-synthesis being used for qualitative evidence.⁽¹⁹⁾ Where the evidence is not standardised for either of these forms of synthesis it is presented in narrative summaries.⁽¹⁹⁾

The next step is to put the findings into context, this is completed by discussing them and addressing any issues related to the included studies quality and diversity as well as the ability to apply it to practice.⁽¹⁹⁾ The systematic review will collect the information, assess it, combine it with similar studies and present the findings including any limitations identified.^(12, 19)

1.6 Use of systematic reviews in healthcare

Information within the healthcare sector is continuously increasing and systematic reviews are becoming an important aspect of evaluating interventions, new technologies and pharmacology.⁽¹⁶⁾ The accumulation, collection and evaluation of combined outcomes is important in providing healthcare systems and organisations with evidence-based information to inform their care strategies.⁽²²⁾ Systematic reviews are a tool to provide a comparison across multiple studies and explore any differences in the information provided by these studies.⁽²²⁾

Health professionals are under pressure to ensure they are providing best practice in their area of healthcare, however with increasing workloads they do not always have the capacity while at work to keep up to date with current journal articles describing new studies.⁽¹³⁾ The average clinician would need to read 19 articles of original studies each day to be able to synthesize and apply evidence based best practice to improve patient care, yet this is not built into a general clinicians workload.⁽¹³⁾ When

conducted appropriately systematic reviews can reduce this time for clinicians by providing the information in a synthesized format with comparisons and outcomes, which permits the reader to acquire an effective overview of their required topic with significantly reduced effort required.⁽¹³⁾

Systematic reviews are a tool to establish if a clinical activity or intervention is appropriate or practical in that environment.⁽¹⁹⁾ Systematic reviews are also a tool to support proposals for future funding and research in specific areas of healthcare, as well as identify new areas that have potential research capacity.⁽¹⁹⁾ They are also a way for the researcher to provide evidence of successful studies to support future funding applications.⁽¹⁹⁾ These reviews are becoming more widespread in student assignments for both undergraduate and post graduate studies.⁽¹⁹⁾ They are important to be used where there are areas that are unclear or have widely contrasting or unrelated findings, to be able to clarify areas of practice for healthcare professionals as well as the public.⁽¹⁹⁾

Systematic reviews have been identified as being at the top of the 'hierarchy of evidence' when evaluating clinical efficiency for evidence-based practice.⁽¹⁹⁾ Due to this 'hierarchy of evidence' systematic reviews are reported to support the assessment of clinical effectiveness and informs evidence-based practice.⁽¹⁹⁾ Even though the systematic review is at the top of the hierarchical list before it can be depended upon to develop a change to practice the methodology used to assess and appraise the included studies needs to be identified to ensure it was not poorly done.⁽¹⁹⁾ The aggregation of the studies needs to be judged to make sure that there was no bias and that appraisal was undertaken appropriately.⁽¹⁹⁾ This provides evidence that when a systematic review is conducted properly it will provide the best information on a specific area of practice.⁽¹⁹⁾ However not all systematic reviews are conducted appropriately and therefore the processes used by the systematic review needs to be transparent to show it had been conducted appropriately, so that the results will be reliable to inform clinical practice.⁽¹⁹⁾ There may also be biases within a systematic review and the presence of such biases needs to be evaluated before they are accepted as evidence to change practice.⁽¹⁹⁾ There are evaluation and appraisal tools that can assist in assessing the quality and reliability of the review prior to integrating it into practice.⁽¹⁹⁾ There also needs to be an assessment of the types of studies included in the review and whether the interventions integrated are relevant and appropriate to be included together, or if they should be separated into individual types of intervention?⁽¹⁹⁾ The findings in the systematic review may not correlate to a large single trial that was conducted appropriately and classed as high quality, therefore there needs to be a deeper investigation into both prior to changes in practice being recommended.⁽¹⁹⁾

1.7 Guidelines

Clinical guidelines are a tool for health professionals to make decisions in clinical practice.⁽²³⁾ They are designed to support healthcare professionals to make informed choices in regards to patient care so that clinicians can provide evidence informed care for optimal patient outcomes, as well as providing cost effectiveness for the healthcare system.^(23, 24) Guidelines are developed by integrating evidence from studies in a systematic way and situating them into recommendations for practice.⁽²³⁾ Clinical practice guidelines aim to standardise care and reduce the variations of practice within as well as between organisations, with the overarching aim of reducing variation in patient outcomes.⁽²⁵⁾

When clinical guidelines were first being developed they were created by experts in a field of health, and then a consensus between them for the final product.⁽²³⁾ Nakayama gave this process the title 'GOBSAT (Good Old Boys Sat Around a Table)'.⁽²⁵⁾ Ideally all guidelines should be evidence-based and where feasible this evidence should be based on experimental evidence, however this is not always possible in areas where there is little research and therefore Level 4 (expert opinion) is the best available alternative.⁽²⁶⁾

Guideline development has now become more formalised by linking the recommendations in the guidelines with the evidence that supports them.⁽²⁷⁾ Studies have provided evidence that use of clinical guidelines improves the process of care and the health outcomes of patients.⁽²⁷⁾ To develop valid guidelines that are functional there needs to be a systematic review of the appropriate evidence in the area the guideline is required, this will ensure all relevant studies have been used in the development.⁽²⁴⁾ Other aspects needed to underpin the guideline is that a group that are experts in the field need to be gathered to translate the evidence into the guidelines.⁽²⁴⁾ To ensure that the translation of the evidence and development of the guideline is of a high standard the group assembled for the task should be multidisciplinary.⁽²⁴⁾ To guarantee that the guidelines are suitable for the task required there should be a team collected of appropriately skilled people to develop the final guideline with sufficient financial support to accomplish the task.⁽²⁴⁾

There is an abundance of research and information in the healthcare sector which can make it confusing to those responsible for developing new guidelines or updating out-dated ones.⁽²³⁾ This is evident in the fact that 'indexed Medline publications' has increased from 2500 to greater than 5000 per month in the last 20 years.⁽²⁸⁾ Across the World, clinical practice guidelines have been developed since the 1990's with the numbers of guidelines increasing each year.⁽²⁸⁾ For example in 1995 there were 55

surgical guidelines indexed in Medline, with an increase to 203 in the year 2000 and a further increase to 506 publications in 2009.⁽²⁸⁾ With this continued increase in journal publications and guideline development there is an increased need to ensure guidelines are developed using current, reliable evidence and evaluated regularly to ensure they remain up to date.

By developing evidence-based clinical guidelines a bridge between research and clinical practice can be established to integrate findings into procedure.⁽²³⁾ The development of these guidelines provides a platform to standardise care and ultimately improve patient outcomes.⁽²³⁾ To ensure clinical guidelines are current and accurate they need to be developed in a systematic way with the area they are being developed for kept at the forefront.⁽²³⁾ The implementation of strategies needs to be circulated to appropriate staff, and there also needs to be regular evaluation provided of the implementation to ensure it remains appropriate to the outcome required.⁽²³⁾ If guidelines are not evaluated periodically for their continued validity and their content there could be an interruption in the process of care which can then lead to poor outcomes for patients.⁽²⁹⁾ New medical and scientific information becomes available regularly and if guidelines do not reflect this they would become obsolete.⁽²⁹⁾ There is no set time limit to evaluate and update clinical guidelines however organisations should schedule regular review dates to ensure they do not become out-dated.⁽²⁹⁾ Even though these strategies are optimal when developing clinical guidelines health professionals need to be mindful that not all guidelines have been developed using these criteria and therefore may have had outside influences in their development.⁽²³⁾ Due to the different influences involved during development the clinical guidelines credibility may be obscured due to lack of research evidence.⁽²³⁾ The composition of the guideline development group not being appropriate or adequate, the lack of agreement with the development process between the group or other stakeholders may also reduce the integrity of the clinical practice guideline developed.⁽²³⁾ A conflict of interest between the members of the development group, no provision of an independent external reviewer, and no transparency in the agreement process during development can also reduce the reliability of the newly developed guideline.⁽²³⁾

Guidelines may be inconsistent with the evidence if there was a lack of appropriate scientific evidence for their development, and if there was insufficient evaluation of any design weaknesses in the studies.⁽²⁹⁾ There is also the fact that clinical practice guidelines can be inconsistent across organisations where different people are responsible for their development and use different resources. Other aspects that need to be ruled out are if there are any biases either within the group who developed the guideline, or where the interests of those paying for the guideline development are considered instead of the patient's best interest.⁽²⁹⁾ In America the Institute of Medicine developed

recommendations for organisations developing guidelines to enhance their qualities.⁽²⁹⁾ The recommendations summarised the attributes that should be included to ensure guideline documents were of high quality which are 'validity, reliability, clinical applicability, clinical flexibility, clarity, multidisciplinary process, scheduled review and documentation'.⁽²⁹⁾

Guideline dissemination and implementation using passive distribution of the clinical practice guidelines is insufficient to provide a change in practice.⁽²⁸⁾ Merging more than one strategy in the dissemination of information when implementing a new clinical practice guideline, has been identified as the optimal approach when practice modification is required.⁽²⁸⁾ There are different forms of interventions that are used to inform healthcare professionals and patients about clinical practice guidelines and encompass education, including the supply of education material, meetings and outreach visits, reminders and decision support methods as well as conducting audits and feedback of the results.⁽³⁰⁾

Publishing a clinical practice guideline does not equate to its uptake and a change of practice advocated by the research.⁽³¹⁾ Barriers to clinical practice guideline uptake varies between organisations as well as between healthcare professional groups.⁽³¹⁾ Prior to introducing clinical practice guidelines the potential barriers to uptake need to be identified and implementation strategies developed to address them.⁽³¹⁾ If barriers are not considered and reduced the implementation may fail.⁽³¹⁾ Each setting has different barriers therefore implementation strategies need to consider these and may need to differ across organisations as well as within organisations in the different wards.⁽³¹⁾ Some barriers to be considered are the quality of the guideline as well as the evidence that was used to develop it.⁽³¹⁾ Also, VTE clinical practice guidelines have been described as preventing clinical judgment and decision making of the healthcare professionals, as they standardise the clinicians practice around the average patient.⁽²⁵⁾ Healthcare professionals generally in the medical profession, believe that clinical practice guidelines are a strategy to cut healthcare costs and promote litigation by patients.⁽²⁵⁾ Other barriers that have been detected were a lack of knowledge about the guidelines coupled with a resistance to change current practice.⁽³²⁾ There are costs associated with the development of the clinical practice guideline as well as the implementation process that could exclude some organisations due to lack of funding.⁽³²⁾ In some organisations there is a lack of system support for change, or healthcare professionals are reluctant to change entrenched behaviours and methods.⁽³¹⁾

Multiple strategies for implementation have been identified as being more effective when employing a clinical practice guideline.⁽³¹⁾ Broadly circulating clinical practice guidelines using electronic mail or the post is thought to be necessary for implementation being successful.⁽³¹⁾ However, if this is the only

intervention used it is quite ineffective.⁽³¹⁾ Providing the guidelines by themselves is also not effective to elicit a change in practice.⁽³¹⁾ Traditional educational strategies such as face to face group sessions have also been identified as being ineffective when used in isolation to other methods.⁽³¹⁾ The most effective strategy to use in implementing clinical practice guidelines into practice is a combination of education, reminders and audits with feedback to staff.⁽³¹⁾ Other strategies to enhance guideline uptake are interactive education, decision support systems, educational outreach, interventions specific for patients as well as ensuring the guideline is simple and easy to follow.⁽³¹⁾

1.8 Compliance with clinical practice guidelines of venous thromboembolism risk assessment and prophylaxis initiation

1.8.1 Venous Thromboembolism (VTE) Background

VTE is the collective name for Deep Vein Thrombosis and Pulmonary Embolism.⁽⁴⁾ A deep vein thrombosis (DVT) occurs when a blood clot forms in the deep veins of the leg and sometimes the pelvis.⁽⁴⁾ A pulmonary embolism (PE) occurs where some or all of the clot breaks away and moves from the vein, to cause an obstruction in the pulmonary artery or its branches in the lungs.⁽⁴⁾ A DVT may cause leg swelling, tenderness and pain, with a PE showing signs of chest pain, bloody sputum, shortness of breath and heart failure.⁽⁴⁾ There are instances where there are no signs or symptoms and diagnosis is made after a person dies.⁽⁴⁾

There are two main categories of risk factors for VTE. The first is those associated with the clinical setting such as surgery and type of surgery, for example, major surgery with medical risk factors, immobilisation and immobilising treatments, medical patients with additional risk factors, some fractures, stroke, some chemotherapy treatments, acute spinal injury or multiple trauma.⁽¹⁾ The second category relates to patient factors, such as age, previous history of DVT/PE, past history of major surgery, recent pregnancy, malignancy, obesity, oral contraceptive or hormone replacement, inflammatory bowel disease, as well as any thrombophilia conditions.⁽¹⁾ There are a number of other risk factors that have been described in Table 2.^(1, 33)

Table 2 Overview of identified Risk Factors for developing VTE

Risk Factors for developing venous thromboembolism	
Individual Patient Risk Factors	Clinical Setting Risk Factors
Age (VTE risk increases after the age of 40 and greater over 60 years)	All surgical procedures especially orthopaedic, pelvic, thoracic and abdominal
Previous history of DVT/PE	Immobilisation especially if it is prolonged
Family history of VTE	Major surgery with medical risk factors
Acute medical illness	Some fractures
Pregnancy or recent birth	Acute spinal injury or multiple trauma
History of varicose veins	some forms of chemotherapy
Malignancy or cancer treatment	
Obesity	
Oral contraceptive or hormone replacement therapy	
Thrombophilia conditions either inherited or acquired	
Inflammatory bowel disease	
Previous major surgery	
Stroke causing immobility	
Heart conditions including myocardial infarction, heart failure	
Chest infections either acute or acute on chronic	
Other severe infection	

VTE is an increasing healthcare problem across the globe with 9,250 cases of VTE in females and 5,466 cases in males reported in Australia in 2008. This is a total of 14,716 cases of VTE across Australia for the year 2008.⁽³⁴⁾ This represents an increase in rates of VTE in Australia of 2% since 2004/05.⁽³⁴⁾ It has been estimated that of the people who have had a DVT, about 12% will die.⁽³⁵⁾ and that PE is responsible for about 10% of all hospital deaths.⁽³⁶⁾ The estimated survival rate of those with VTE is 47.5% after eight years, 53.5% after five years and 63.6% after one year.⁽³⁷⁾ Morbidity for survivors of VTE can be quite debilitating and some of the complications may not occur until weeks or months after the initial blood clot.⁽³⁸⁾ In the United Kingdom (UK) the population is about three times that

of Australia and it is estimated that VTE is responsible for about 25,000 deaths each year.⁽³⁹⁾ This estimate shows that the incidence of VTE in the UK is 50% greater than in Australia.⁽³⁹⁾ It is also estimated that about 300,000 people in the United States of America die of VTE each year, which is about four times the death rate in Australia.⁽⁴⁰⁾ These factors have all been attributed to the underutilization of VTE risk assessment tools and early initiation of prophylaxis.⁽⁴⁰⁾

The incidence of VTE has been identified as being greater in hospitalised patients than those living in the community who are the same age, and is as much as 100 times higher.⁽¹⁾ A study was conducted on a hospital population spanning from 1980 to 1990 in a county in America to assess the percentage of risk to developing VTE with this supporting the statement that there was a 100 times greater incidence of developing VTE amongst hospitalized patients.⁽⁴¹⁾ A multinational study to investigate the use of prophylaxis for patients with risk factors for VTE was undertaken⁽³⁾ and the findings of this study suggest that across the world there were a substantial number of hospitalised people at risk of developing VTE, and that prophylaxis methods recommended for their risk factor/s were not adequately utilized.⁽³⁾

Virchow's triad was developed to explain the factors that predispose a person to developing a VTE if they are present.^(42, 43) These three factors are stasis, where the flow of blood through the blood vessels is slowed or stopped, hypercoagulability, where blood will coagulate faster than usual and endothelial damage which is where there is damage to the cells lining the walls of the heart, blood vessels and lymph vessels.^(42, 43) Stopping or reducing any or all of the factors in Virchow's triad will reduce the possibility of patients developing VTE.⁽⁴³⁾ Providing prophylaxis to patients in the form of mechanical devices to increase the flow of blood in the legs and reduce the potential of pooling is one way to remove one of the aspects of Virchow's triad. Administering anticoagulants is another way to remove one of the aspects of Virchow's triad by reducing the coagulation effect of the blood.⁽⁴³⁾ The third factor of endothelial damage is more difficult to avoid especially in surgical patients, however awareness of this and early use of mechanical and pharmacological prophylaxis can assist in reducing the chance of development.

The National Health and Medical Research Council (NHMRC) state that, '*The incidence of VTE as a complication of hospital admission is commonly underestimated. There is good evidence that VTE prophylaxis measures continue to be under-utilised or used sub-optimally*'.⁽¹⁾ The National Institute of Clinical Studies have estimated that in Australia about 2,000 people die as a result of VTE each year with about 30,000 being hospitalised.⁽¹⁾ Of the 2,000 deaths, many are potentially preventable through

appropriate risk assessment and the corresponding use of measures like anti-embolic stockings, or antithrombotic drugs.⁽¹⁾

VTE represents a significant cost to the Australian healthcare system with recent estimates of approximately \$10,007 per case and can lead to an increase in short term as well as long term morbidity and mortality.^(3, 4, 34) People of working age represented 43% of cases of VTE in 2008,⁽³⁴⁾ suggesting that there may also be costs to the community in terms of lost income. In Australian hospitals in the 2004-05 period the total 'hospital inpatient expenditure on VTE' was \$71.04 million.⁽³⁴⁾ In 2007 it was estimated that for 2008 the total inpatient expenditure for VTE in hospitals would be \$81.2 million.⁽³⁴⁾ These cost did not include any out of hospital expenses such as radiology, medical specialists, general practitioner, pathology, pharmaceuticals or allied health.⁽³⁴⁾ These costs also did not take into account ongoing health system expenditure or associated costs.⁽³⁴⁾ Not only does VTE affect costs within the health system it also impacts on the community with costs for carers, productivity losses, equipment for homes or modifications needed as well as costs of people transferring from the workforce to welfare or disability payments.⁽³⁴⁾ There is a high burden on the health care system and health care costs in relation to people developing this disorder, and it is not just a national problem but also an international concern.^(3, 44) Increasing costs associated with VTE is not unique to Australia, similar trends have been reported in the USA.⁽³⁴⁾

Prevention of VTE by assessing the risk using a risk assessment tool and early prophylaxis is an important option in reducing the rates of VTE in the acute hospital setting.^(1, 3, 4) It has also been shown that if appropriate prophylaxis is used for patients at risk of VTE, there will be a significantly reduced incidence and therefore reduction in the long term costs.⁽³⁾

The optimal way to prevent VTE in the acute setting is to undertake a risk assessment on all adult patients as they are admitted.^(1, 3) and then provide prophylaxis in accordance with that assessment.⁽⁴⁾ A risk assessment tool is a standardised screening tool used to identify indicators of potential risks using predetermined criteria.⁽⁵⁾ It can be used to systematically assess a person's level of risk when they are admitted to hospital as well as anytime their condition changes during their hospitalization.⁽⁵⁾ The risk assessment tool used to assess risk in hospitalized patients are ideally developed from national guidelines and is usually a scoring system to assess the patients risk factors.⁽⁶⁾ Points are assigned to each risk factor in relation to the amount they contribute to the risk.⁽⁶⁾ Once the risks have been identified the score is calculated giving an overall risk score.⁽⁶⁾ The risk assessment form will generally identify guidelines of what prophylaxis should be initiated for different risk factors; these vary slightly in

different facilities however they are basically the same.⁽⁶⁾ An example of a VTE risk assessment tool, labelled 'Thrombosis Risk Assessment for Surgical and Medical patients'⁽⁴⁵⁾ can be found in figure 1. The only time prophylaxis will not be used is when there is a contraindication such as someone with an increased risk of bleeding or a history of bleeding disorders, and this will be assessed on an individual basis.⁽⁶⁾

Figure 1 Example of a Thrombosis Risk Assessment Tool⁽⁴⁵⁾

NOTE:

This figure/table/image has been removed
to comply with copyright regulations.
It is included in the print copy of the thesis
held by the University of Adelaide Library.

VTE prophylaxis can be categorised as being either mechanical or chemical.⁽⁴⁶⁾ Mechanical prophylaxis includes promotion of early ambulation of the patient, if possible within 24 hours of surgery, the use of anti-embolic/graduated compression stockings and intermittent pneumatic compression.⁽⁴⁶⁾ Encouraging all patients to ambulate and maintain adequate hydration is important despite their risk category.⁽⁴⁶⁾ Anti-embolic stockings apply graduated pressure from the ankle up the leg, come in knee high and thigh high lengths and are used to increase the blood flow velocity in the legs by applying pressure to the lower leg vasculature.⁽⁴⁶⁾ The intermittent pneumatic compression device is to provide effective blood flow from the lower limbs and adjusts itself to the patients vascular refill time.⁽⁴⁶⁾ Chemical prophylaxis generally provided in the form of low-dose unfractionated heparin (LDUH) or low molecular weight heparin (LMWH).⁽⁴⁶⁾ Generally, these are provided as a subcutaneous injection, however there are oral products available for specific conditions such as warfarin.⁽⁴⁶⁾ Chemical prophylaxis interfere with the steps in coagulation cascade (heparin) or synthesis of coagulation factors (warfarin).⁽⁴⁷⁾ Generally the VTE risk prevention guidelines will advocate a combination of both mechanical and chemical prophylaxis being used, especially during the high risk period which is immediately after surgery.⁽⁴⁶⁾

Clinical practice guidelines are tools that set the benchmark for patient care and are used by healthcare professionals to improve patient care with recognised standards to guide decisions.⁽²⁾ Guidelines are generally developed following a review of available evidence in association with clinical experts.⁽²⁾ By producing national guidelines and encouraging healthcare facilities and professionals to follow them, there is an attempt at standardisation of patient care, that should produce improvements in the quality of delivered care.⁽²⁾ Quite a few countries have VTE guidelines to provide a standardised way for risk assessment and prophylaxis use. In Australia there is the Clinical Practice Guideline for the prevention of VTE in patients admitted to Australian Hospitals.⁽¹⁾ Through this initiative there was a program called 'Stop The Clot' that was developed to assist and support private hospitals in Australia, and was funded by the Australian Commission on Safety and Quality in Health Care.⁽⁴⁴⁾ The National Institute for Clinical Excellence (NICE) developed guidelines for England and Wales, which was then used to develop a quick reference guide titled 'Venous thromboembolism: reducing the risk'.^(33, 48) In the USA the American College of Chest Physicians developed the Guidelines on antithrombotic and thrombolytic therapy that are used in several countries.⁽⁴⁹⁾

In a healthcare context, a barrier can be defined as anything that inhibits or hinders a healthcare professional conducting a VTE risk assessment and/or prophylaxis initiation. Barriers have been identified for undertaking VTE risk assessment and prophylaxis initiation. One is that there is a lack of awareness by healthcare professionals to the incidence of VTE and that it can manifest after the patient

has been discharged from hospital.⁽⁴⁴⁾ Another barrier is a lack of education and/or knowledge about VTE risk assessment, such as who has the responsibility of undertaking the assessment.⁽⁴⁴⁾ Other areas of knowledge deficit are: availability of a risk assessment tool and how to undertake the assessment, as well as what prophylaxis should be initiated for which level of risk.⁽⁴⁴⁾ Disagreement may occur where a contraindication is evident due to the potential bleeding risks for a patient, such as those already on anticoagulant therapy or patients with either a family history or acquired history of a bleeding disorder.⁽⁴⁴⁾ The last main area identified as a barrier is inadequate system supports.⁽⁴⁴⁾ This may range from a health service having no policies for VTE prophylaxis with no audits to check the systems viability, to different practices in different units in the same organisation, to no clear identification of the responsibility of who is to action the VTE risk assessment and prophylaxis.⁽⁴⁴⁾

Facilitators in this context may be described as anything that makes conducting a VTE risk assessment easier for a healthcare professional. A facilitator for VTE risk assessment and prophylaxis may be as simple as having staff who were enthusiastic and take the initiative to promote VTE prophylaxis within an organisation.⁽⁴⁴⁾ An example of this is seen where a hospital create a position for a nurse champion who is proactive in VTE prophylaxis and who provides support and education to other staff in this area.⁽⁴⁾ Other examples of facilitators may include methods of raising awareness of when a risk assessment should be undertaken and by whom.⁽⁴⁴⁾ This may range from pre-printed forms inserted into patient's notes or automated computer messages.

Queensland Health's Safe Medication Practice Unit (SMPU), discussed problems with VTE risk assessments being completed on patients.⁽⁵⁰⁾ They found that even though nurses are capable in completing risk assessments it increases their workload which acted as a barrier to them doing so.⁽⁵⁰⁾ The professional group within the healthcare system with the greatest direct patient care is nursing.⁽⁵¹⁾ and therefore nurses can have an integral role in implementing the risk assessment and influencing prophylaxis used.⁽⁵¹⁾ The SPMU acknowledged that depending on the patients risk factor, the nurses were unable to initiate all required prophylaxis such as prescribe chemical prophylaxis where necessary.⁽⁵⁰⁾ It is acknowledged that chemical prophylaxis can only be prescribed by a medical practitioner, however the nurse as patient advocate can identify patient needs using the VTE risk assessment tool and recommend what prophylaxis is needed according to this tool.⁽⁵⁰⁾ The SMPU recommend that medical practitioners be the ones to complete the risk assessment as they are able to prescribe medications where necessary.⁽⁵⁰⁾ However, this approach may be limiting for some rural and remote hospitals that are staffed solely by nurses with local general practitioners having hospital rights

that visit only when called in to consult when one of their patients has presented and may need admission or to check their patients who are admitted or when medication prescribing is needed.⁽⁵²⁾

A quasi-experimental pre-test post-test design research project using a case note audit was undertaken in a Queensland hospital in 2005 to 2009, showed that there was an increase of appropriate prophylaxis being used in admitted patients over the five years from 27% pre-education to 85% post education of nursing staff.⁽⁴⁾ This improvement was identified as being through evidence based education sessions which empowered nurses to take responsibility for VTE risk assessments.⁽³⁾ The strategy used in the Queensland study is a way to identify a responsible person to be accountable for completing a VTE risk assessment to ensure that it is completed. This can then address concerns identified by the SMPU with the nurse arranging prophylaxis, either by starting mechanical and/or notifying the doctor of chemical prescribing that is needed.

1.8.2 VTE guidelines

There are national guidelines and recommendations for VTE prevention and management, globally some of these are the 'American College of Chest Physicians guidelines on the antithrombotic and thrombolytic therapy'⁽⁴⁹⁾, 'report of the independent Expert Working Group on the prevention of venous thromboembolism in hospitalised patients'⁽⁵³⁾ in the United Kingdom, and the 'Australia & New Zealand working party on the management and prevention of venous thromboembolism'⁽⁴⁶⁾. Many hospitals and healthcare facilities develop their own clinical practice guidelines with some using national recommendations as a guide to their development. The three national guidelines discussed in this review all provide similar recommendations such as all adults admitted to the acute care facility having a risk assessment for VTE completed within twenty four hours of admission and then again if their condition changes (such as deterioration needing increased prophylaxis, or improvement with increased mobility and a reduction in prophylaxis).^(46, 49, 53) These guidelines also identify the type of prophylaxis to be used for different risk levels in a similar way with some mechanical prophylaxis being identified as ambulation, graduated compression stockings or intermittent pneumatic compression devices, and chemical prophylaxis being administered either by injection or orally depending on the level of risk and presenting conditions.^(46, 49, 53)

Even though VTE clinical practice guidelines have been around for many years they do not always translate into practice.^(54, 55) This leads to a variation in quality of care provided within a healthcare facility as well as between different organisations.⁽⁵⁶⁾ If these guidelines are followed high quality care is provided to improve patient outcomes, if they are not there could be adverse effects with unexpected

poor clinical outcomes.⁽⁵⁶⁾ There are different reasons for clinical guidelines not being followed by healthcare professionals and compliance can be monitored and assessed with clinical audits.⁽⁵⁶⁾ Another strategy to assess compliance is for healthcare organisations to set benchmarks for clinical practice using evidence-based research, and use these as the standard to audit against.⁽⁵⁶⁾

1.9 Rural Health Disparities

Australia is made up of many subcultures and one of these is the rural culture. Rural Australians identify themselves as being unique to those who live in cities, and in some areas have dissimilar views of health.⁽⁵⁷⁾ This is not exclusive to Australia with many rural communities identifying that they are different to urban areas around the world.⁽⁵⁸⁾ The differences in view have developed from the portrayal of country men being rugged and strong throughout history.⁽⁵⁷⁾ It has been acknowledged that people from rural and remote locations have a 'she'll be right mate' attitude, with higher incidences of smoking and drinking, increased amounts of unemployment and frequent travelling on long open roads that support this.⁽⁵⁷⁾ The World Health Organisation states health is 'a balance between the physical, emotional, social and spiritual well-being, not just the absence of disease or infirmity'.⁽⁵⁹⁾ People have different understandings about what 'health' means and this can vary between people as well as cultural groups.⁽⁵⁷⁾ Our understanding about what health can be important because our approach to care and prevention will be reflected by this.⁽⁵⁷⁾ In the past the view of health was that if a person was productive and working that person was healthy and there was a lack of disease.⁽⁵⁷⁾ If this is a person's perception of health then they will put a low importance on the prevention of illness or the promotion of good health, as they will not see the need for these strategies if they are feeling well and remain productive.⁽⁵⁷⁾ There has been a change in perceptions of health and wellness with promotion and prevention becoming a high priority in some areas, however in areas of rural Australia there is still the belief in the old view of health, where being injured or unwell is identified as a weakness and less socially acceptable.⁽⁵⁷⁾ This observation is the view of both men and women in rural areas and they are expected to be self-reliant, be highly self-sufficient and independent.^(57, 58) Due to this perception of health by rural people they often do not present to a doctor for assistance until they are in the late stages of the disease leading to more complicated interventions being required.⁽⁵⁷⁾ This is supported by a study where they state that there is a self-reliant expectation in the rural elderly population in America and this leads to an avoidance of attending the doctor and attempting to manage their own health.⁽⁶⁰⁾ Due to health being allocated a low priority in everyday life it leads to the view that seeking medical assistance or presenting at a hospital would be a last resort.⁽⁵⁸⁾

Life expectancies vary between metropolitan and rural Australians with those living in rural areas expected to die 4 years earlier than their metropolitan counterparts, and this difference increases the greater the remoteness.⁽⁵⁷⁾ This is not unique to Australia with rural peoples health status being poorer than their urban counterparts around the world.⁽⁵⁸⁾ Indigenous Australians have a lower life expectancy than other Australians and this rises considerably with their increase in remoteness.⁽⁵⁷⁾ The reasons for inequalities in health between rural, remote and metropolitan Australians are linked to the social isolation of remote areas, the socioeconomic disadvantage and the distance to the nearest health facility.⁽⁵⁷⁾ The mortality rates in rural areas due to injury are double those in the urban setting, with road accidents being triple the rate to urban settings and falls in the aged population being double that of the urban setting.⁽⁵⁷⁾ There is less access to healthcare in the rural setting than in urban areas due to transport availability, the costs of transport, distance to the nearest healthcare facility and time factors, with deserts, mountains and jungles causing problems with access.^(57, 58) Adding to these restrictions there are less healthcare facilities in rural and remote settings as well as lower numbers of healthcare professionals moving to these areas to practice.^(57, 61) Rural and remote health service delivery is notably affected by reductions in funding and other resources such as shutting down schools, banks, smaller hospitals and some government offices.⁽⁵⁸⁾ When these services are reduced in rural and remote areas the staff that operate these services also leave which reduced the population and leads to more services being closed, and therefore providing a disadvantage to those remaining in the area.⁽⁵⁸⁾

Chapter 2: The Systematic Review Protocol

The following chapter is the approved *a priori* protocol⁽⁶²⁾ for the systematic review on which this thesis is based. The format is based on that recommended by the Joanna Briggs Institute and consists of standardised sections and includes some material from the previous chapter (Chapter 1) as background to the review.

2.1 Review Question/Objectives

The objective of this review was to identify, appraise and synthesise the best available evidence of the facilitators and barriers to venous thromboembolism (VTE) Risk Assessment and prophylaxis.

More specifically, the review question was: To what extent are national guidelines for risk assessment and prophylaxis of VTE adhered to in the acute care setting, and what are the facilitators and barriers?

2.2 Background

Venous Thromboembolism (VTE) is the collective name for Deep Vein Thrombosis and Pulmonary Embolism.⁽⁴⁾ A deep vein thrombosis (DVT) occurs when a blood clot forms in the deep veins of the leg and sometimes the pelvis.⁽⁴⁾ A pulmonary embolism (PE) occurs where some or all of the clot breaks away and moves from the vein, to cause an obstruction in the pulmonary artery or its branches in the lungs.⁽⁴⁾ A DVT may cause leg swelling, tenderness and pain, with a PE showing signs of chest pain, bloody sputum, shortness of breath and heart failure.⁽⁴⁾ There are instances where there are no signs or symptoms and diagnosis is made after a person dies.⁽⁴⁾

There are two main categories of risk factors for VTE. The first is those associated with the clinical setting such as surgery and type of surgery, for example, major surgery with medical risk factors, immobilisation and immobilising treatments, medical patients with additional risk factors, some fractures, stroke, some chemotherapy treatments, acute spinal injury or multiple trauma.⁽¹⁾ The second category relates to patient factors, such as age, previous history of DVT/PE, past history of major surgery, recent pregnancy, malignancy, obesity, oral contraceptive or hormone replacement, inflammatory bowel disease, as well as any thrombophilia conditions.⁽¹⁾ There are a number of other risk factors that have been described in Table 2 (chapter 1, section 1.6.1).

In 2008, approximately 9,250 cases of VTE in females and 5,466 cases in males were reported in Australia. This is a total of 14,716 cases of VTE across Australia for the year 2008.⁽³⁴⁾ This was an increase in rates of VTE in Australia of 2% since 2004/05.⁽³⁴⁾ In 2003 it was identified that of the people who had a DVT about 12% will die.⁽³⁵⁾ It has been discovered that PE is responsible for about 10% of all hospital deaths.⁽³⁶⁾ The estimated survival rate of those with VTE is 47.5% after 8 years, 53.5% after 5 years and 63.6% after one year.⁽³⁷⁾ Morbidity for survivors of VTE can be quite debilitating and some of the complications may not occur until weeks or months after the initial blood clot.⁽³⁸⁾ In the United Kingdom (UK) the population is about three times that of Australia and it is estimated that VTE is responsible for about 25,000 deaths each year.⁽³⁹⁾ This estimate shows that the incidence of VTE in the UK is 50% greater than in Australia.⁽³⁹⁾ It is also estimated that about 300,000 people in the United States of America die of VTE each year, which is about four times the death rate in Australia.⁽⁴⁰⁾

VTE cost the Healthcare system about \$10,007 for each case and can lead to short term as well as long term morbidity and mortality.^(3, 4, 34) It has been identified that people of working age represented 43% of cases of VTE in 2008.⁽³⁴⁾ In Australian hospitals in the 2004-05 period the total 'hospital inpatient expenditure on VTE' was \$71.04 million.⁽³⁴⁾ In 2007 it was estimated that for 2008 the total inpatient expenditure for VTE in hospitals would be \$81.2 million.⁽³⁴⁾ These cost did not include any out of hospital expenses such as radiology, medical specialists, general practitioner, pathology, pharmaceuticals or allied health.⁽³⁴⁾ These costs also did not take into account ongoing health system expenditure or associated costs.⁽³⁴⁾ Not only does VTE affect costs within the health system it also impacts on the community with costs for carers, productivity losses, equipment for homes or modifications needed as well as costs of people transferring from the workforce to welfare or disability payments.⁽³⁴⁾ There is a high burden on the health care system and health care costs in relation to people developing this disorder, and it is not just a national problem but also an international concern.^(3, 44) This cost is not restricted to Australia as the United States have identified that there are higher costs each year during and after a VTE event.⁽³⁴⁾

Therefore prevention of VTE by using the risk assessment tool and early prophylaxis is the best option to reduce the rates of VTE in the acute hospital setting.^(1, 3, 4) It is also documented that if appropriate prophylaxis is used for patients at risk of VTE, there will be a significantly reduced incidence and therefore reducing the long term costs.⁽³⁾

VTE Prophylaxis can be categorised as either mechanical or chemical.⁽⁴⁶⁾ Mechanical prophylaxis is early ambulation, the use of anti-embolic/graduated compression stockings, intermittent pneumatic

compression.⁽⁴⁶⁾ Encouraging all patients to ambulate and maintain adequate hydration is important despite their risk category.⁽⁴⁶⁾ Anti-embolic stockings apply graduated pressure from the ankle up the leg, come in knee high and thigh high lengths and are to increase the blood flow velocity in the legs.⁽⁴⁶⁾ The intermittent pneumatic compression device is to provide effective blood flow from the lower limbs and adjusts itself to the patients vascular refill time.⁽⁴⁶⁾ The chemical prophylaxis generally provided is low-dose unfractionated heparin (LDUH) or low molecular weight heparin (LMWH).⁽⁴⁶⁾ Generally these are provided as a subcutaneous injection, however there are oral products available for specific conditions.⁽⁴⁶⁾ To maintain haemostasis the body had a coagulation cascade and the LDUH and LMWH either inhibit or alter different steps in this cascade.⁽⁴⁷⁾ Generally the risk guidelines will advocate a combination of both mechanical and chemical prophylaxis being used, especially during the high risk period.⁽⁴⁶⁾

The NHMRC are one of the groups in Australia responsible for the development of national recommended clinical practice guidelines.⁽¹⁾ By producing national guidelines and encouraging healthcare facilities and professionals to follow them, there is some attempt at standardisation of patient care, and ultimately improvements in the quality of delivered care.⁽²⁾ Quite a few countries have venous thromboembolism guidelines to provide a standardised way for risk assessment and prophylaxis use. In Australia there is the Clinical Practice Guideline for the prevention of venous thromboembolism in patients admitted to Australian Hospitals.⁽¹⁾ Through this initiative there was a program called 'Stop The Clot' developed to assist and support Private hospitals in Australia, which was funded by the Australian Commission on Safety and Quality in Health Care.⁽⁴⁴⁾ The National Institute for Clinical Excellence (NICE) developed guidelines for England and Wales, which was then used to develop a quick reference guide titled 'Venous thromboembolism: reducing the risk'.^(33, 48)

Barriers have been identified for undertaking VTE risk assessment and initiating prophylaxis. One is that there is a lack of awareness by healthcare professionals to the incidence of VTE and that it can manifest after the patient has been discharged from hospital.⁽⁴⁴⁾ Another barrier are deficits in education and knowledge about the risk assessment.⁽⁴⁴⁾ That a risk assessment tool is available and how to undertake completing it, as well as what prophylaxis should be initiated for which level of risk.⁽⁴⁴⁾ A barrier is where healthcare professionals dispute or disagree with the guidelines even if they are evidence-based for medical patients, or bleeding concerns for surgical patients.⁽⁴⁴⁾ The last main area identified as a barrier is inadequate system supports.⁽⁴⁴⁾ This can range from a health service having no policies for VTE prophylaxis with no audits to check the systems viability, to different practices in different units in the same organisation, to no clear identification of the responsibility of the actions.⁽⁴⁴⁾ A

facilitator for VTE risk assessment and prophylaxis is identified as having staff who were enthusiastic and take the initiative to promote VTE prophylaxis within the organisation.⁽⁴⁴⁾ This could be an initiative of the hospital by creating a position for a nurse champion who would be proactive in VTE prophylaxis and provide support and education to other staff in this area.⁽⁴⁾

The Safe Medication Practice Unit (SMPU), discussed problems with VTE risk assessments being completed on patients.⁽⁵⁰⁾ They stated that even though nurses are capable in completing risk assessments it increases their workload.⁽⁵⁰⁾ They also mentioned that depending on the patients risk factor, the nurse cannot initiate all required prophylaxis.⁽⁵⁰⁾ It is acknowledged that chemical prophylaxis can only be prescribed by a medical practitioner, however the nurse as patient advocate can identify patient needs and recommend that this be done.⁽⁵⁰⁾ The SMPU are recommending that medical practitioners be the ones to complete the risk assessment as they state that the best practice guidelines were developed for them.⁽⁵⁰⁾ However this may be limiting for some rural and remote hospitals that are staffed by nurses with local general practitioners having hospital rights.⁽⁵²⁾ The professional group within the healthcare system with direct patient care that is the largest is nursing.⁽⁵¹⁾ Therefore nurses can have an integral role in implementing the risk assessment and influencing prophylaxis used.⁽⁵¹⁾

A research project using a case note audit undertaken in a Queensland hospital in 2005 to 2009, showed that there was an increase of appropriate prophylaxis being used in admitted patients over the five years from 27% pre-education to 85% post education of nursing staff.⁽⁴⁾ This improvement was identified as being through evidence based education sessions which empowered nurses to take responsibility for VTE risk assessments.⁽³⁾

There has been a search of the Joanna Briggs Institute, Cochrane, PubMed and CINAHL for systematic reviews on this topic and there was one found that overlaps this one. This review was on 'Strategies to improve prophylaxis for Venous Thromboembolism in hospitals', and the literature review covered the time period from 1996 to May 2003.⁽⁶³⁾ Therefore this review will commence from May 2003 and go to November 2011. This will then add to the previous review by focussing on the facilitators and barriers to healthcare worker compliance with the national guidelines for VTE risk assessments and prophylaxis.

2.3 Criteria for Considering Studies for this Review

2.3.1 Types of Studies

This review considered both quantitative and qualitative research evidence. Due to sufficient research papers being identified textual evidence (non-research) such as opinion papers and reports were not considered for inclusion.

The qualitative component of the review considered studies that focused on qualitative data, including designs such as phenomenology, grounded theory, ethnography, action research and feminist research.

The quantitative component of the review considered both experimental and epidemiological study designs including randomised controlled trials, non-randomised controlled trials, quasi-experimental, before and after studies, prospective and retrospective cohort studies, case control studies and analytical cross sectional studies

2.3.2 Types of Participants

This review considered any studies that identified the barriers and facilitators to compliance with VTE clinical practice guidelines which included any health care professional regardless of their designation involved in the acute care setting. There were multiple practitioners who participated as part of the studies and they were identified under the general heading of healthcare professional.

2.3.3 Phenomena of Interest

This review considered any research studies that assessed compliance with VTE clinical practice guidelines and identified the facilitators and barriers to following the specified guidelines.

2.3.4 Types of Outcomes Measures

This review considered studies that included outcome measures of compliance against clinical practice guidelines either organizational or national, as well as any barriers and facilitators to compliance with the specified guidelines.

2.4 Review Methods

2.4.1 Search Strategy

A three-step search strategy was utilised in this review. The first step was a search of MEDLINE and CINAHL followed by analysis of the words contained in the titles and abstracts, and of the index terms used to describe the articles. A second search using all identified keywords and index terms was then

undertaken across all included databases. Thirdly, the reference list of all retrieved articles was searched for additional studies. Studies published in English were considered for inclusion in the review. Studies published May 2003 to November 2011 were considered for inclusion in the review. The dates were identified due to a systematic review on a similar topic that overlapped the review.⁽⁶³⁾ Other inclusion criteria were that they were related to an acute health service and identified as medical and/or surgical, they addressed compliance or adherence to VTE guidelines, and identified facilitators and/or barriers to compliance with VTE guidelines. (Appendix I)

The databases searched include:

PubMed/MEDLINE

CINAHL

EMBASE

Scopus

The search for unpublished studies included:

ProQuest (for dissertations and theses)

MedNar

Initial search terms used were:

Venous Thromboembolism (VTE, DVT, PE)

Risk Assessment

Guidelines

Compliance

Prophylaxis

Nurse/Doctor

Healthcare worker/professional

Facilitators and Barriers

2.4.2 Critical Appraisal

Quantitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix II).

Qualitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments

from the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix II). There were no disagreements between the reviewers and a third reviewer was not required.

2.4.3 Data Extraction

Quantitative data was extracted from papers included in the review using the standardised data extraction tool from JBI-MAStARI (Appendix III). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives. Qualitative data was extracted from papers included in the review using the standardised data extraction tool from JBI-QARI (Appendix III). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

2.4.4 Data Synthesis

Quantitative research findings were heterogeneous and were unable to be synthesized using JBI-MAStARI, they are therefore presented in narrative summary and tables.

Qualitative research findings were pooled using JBI-QARI. This involved the aggregation or synthesis of findings to generate a set of statements that represented that aggregation, through assembling the findings rated according to their quality, and categorising these findings on the basis of similarity in meaning. These categories were then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesized findings that are to be used as a basis for evidence-based practice. Where textual pooling is not possible the findings will be presented in narrative form.

Chapter 3: Results

The following chapter includes a description of the individual studies, followed by the assessed methodological quality of the included studies.

3.1 Description of Studies

Initially 469 studies were identified as being potentially relevant to the review question. There were 145 duplicates which were removed, leaving 324 studies. Of the 324 articles, 292 were excluded on the basis of not meeting the inclusion criteria after reading the abstracts. Full text articles of the remaining 32 titles were retrieved and examined thoroughly. After this process 20 articles were found to meet the inclusion criteria and were then critically appraised for methodological quality and subsequent inclusion in this systematic review. Eighteen (18) of these studies utilized quantitative study designs and were therefore appraised using the Joanna Briggs Institute MASTARI critical appraisal tool for experimental quantitative studies. After appraisal all of these studies were included, however methodological quality varied. Details of the included studies are presented in Appendix IV. There were 12 quantitative studies excluded after reading the full text articles and these studies (together with reasons for exclusion) are reported in Appendix V. Two studies utilized qualitative research methods and were appraised using the Joanna Briggs Institute Qari appraisal tool for qualitative studies and were also included in the review.

The 20 studies included in this systematic review were 16 quasi-experimental (pre-test post-test) studies,^(4, 64-78) one cohort study,⁽⁷⁹⁾ one case series,⁽⁸⁰⁾ one ethnographic study⁽⁸¹⁾ and one study using grounded theory⁽⁸²⁾ methods. The flowchart in Figure 2 details the study identification process.

Ten of the eighteen quantitative studies were conducted in the United States of America,^(67-70, 73, 75-77, 79, 80) four in Australia^(4, 64, 71, 74) and one each in Saudi Arabia,⁽⁷²⁾ United Kingdom,⁽⁶⁵⁾ Iran⁽⁶⁶⁾ and Ireland.⁽⁷⁸⁾ The two Qualitative studies were conducted in Canada⁽⁸²⁾ and Australia.⁽⁸¹⁾ Twelve of the eighteen included studies reported that they were conducted in a metropolitan location with no studies reported as being conducted in a rural or remote area. The healthcare professionals involved in the included studies were Medical Practitioners (including the titles: physicians, medical officers, junior doctor, consultant, residents, house staff, medical staff, attending physicians and doctors), nurses, nurse practitioners, pharmacists, physician assistant, healthcare assistant and hospital administrators. There were three national best practice guidelines identified in studies, these were the American College of Chest Physicians (ACCP) evidence-based guidelines on antithrombotic and thrombolytic therapy, the Australian and New Zealand best practice venous thromboembolism prevention guideline and the

Expert working group on the Prevention of Venous Thromboembolism in Hospitalised patients recommendations.^(46, 49, 53) The remaining studies either did not mention what guidelines they assessed compliance against or they stated local guidelines were used with no mention of the evidence base behind their development.^(4, 67, 74, 79, 80, 82)

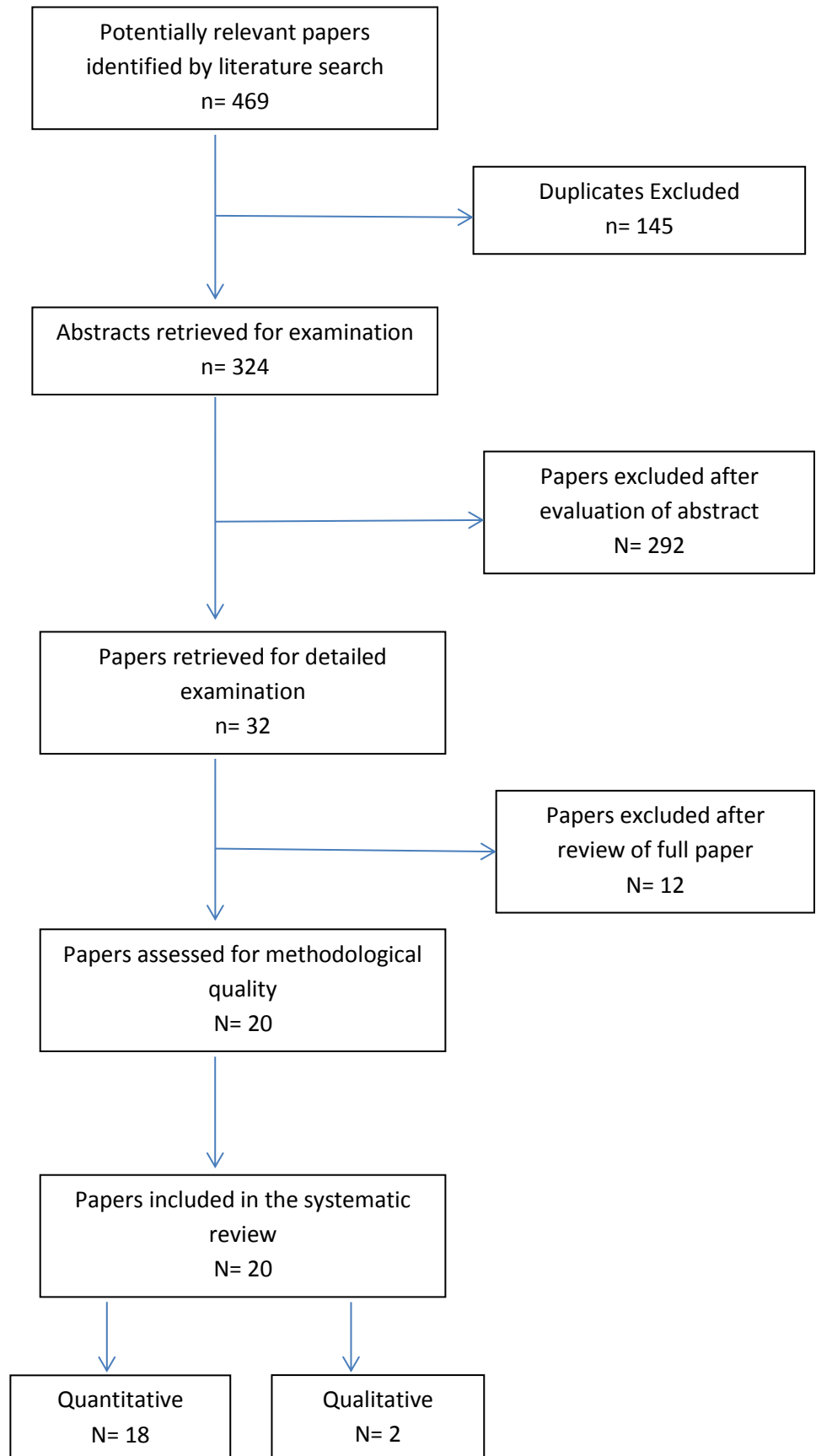


Figure 2 Flowchart detailing the study identification process

3.2 Methodological quality of included studies

The twenty studies identified by the search process were critically appraised by two independent reviewers to assess their methodological quality. It was agreed to include all twenty studies and this was to ensure that facilitators or barriers identified by all of the included studies, regardless of methodological quality were considered. The reviewers discussed the scoring of the studies using the JBI-QARI and JBI-MAStRI critical appraisal tools and identified what would be considered a low, medium or high quality study. The critical appraisal tool used to assess the quasi-experimental pre and post studies had ten criteria of which the first five were not applicable for this form of study, therefore these studies were assessed using five of the criteria. It was decided that for these quasi-experimental studies any that scored 'yes' for none to two of the five criteria would be classed as low quality, those that scored 'yes' for three out of five were moderate and four and above would be high quality methodology. For the studies that were appraised using critical appraisal tools with criteria out of nine if they received 'yes' for none to four of the criteria they would be of low quality, those that scored 'yes' for five to seven of the criteria would be of moderate quality, and 'yes' for eight and above would be high methodological quality.

There was then a discussion on what quality of studies should be excluded and the decision was made to include all studies no matter what the overall quality of the research as excluding on the basis of quality of the written study may exclude identification of important barriers and facilitators. These discussions were undertaken in accordance with the Joanna Briggs Institute policy in regards to critical appraisal using their tools.⁽²⁶⁾ The overall methodological quality of the studies included in this systematic review varied and during the appraisal process, it was determined that sixteen studies were of moderate to high quality using the Joanna Briggs appraisal tools.^(64-68, 70, 72-79, 81, 82) The remaining four were assessed to be of low quality.^(4, 69, 71, 80)

The first study⁽⁶⁹⁾ appraised as being of low quality was a quasi-experimental pre and post study and the reason it was appraised as being low was due to a lack of clarity about whether the groups used for each audit were comparable with each other or if they were treated equally. There was no explanation if the outcomes were measured in the same way for each group. The second study⁽⁴⁾ appraised as low quality was also a quasi-experimental pre and post with it being unclear if each group was comparable to the others, and it was also unclear if the groups were treated equally. There was no discussion or identification of what statistical analysis was used. The third study⁽⁷¹⁾ was a quasi-experimental pre and post study and even though the pre and post intervention groups were comparable it was unclear if they

were treated equally. There was no identification of outcome measures used so it was not clear if they were measured the same for all groups or if they were measured reliably. The last study⁽⁸⁰⁾ appraised as being of low quality was a descriptive/case series and it was not clear if it was a random or pseudo-random sample. There was no information on how patient notes were randomly selected. There was also no stipulation if the confounding factors were identified or if strategies were put in place to address them. There was also no clarity about whether the outcomes were measured in a reliable way. Details of how individual studies scored on the JBI checklists can be found in tables 3 – 6.

Table 3 Results of critical appraisal of included quasi-experimental studies using JBI-MAStARI

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Al-Tawfiq, Saadeh ³⁷	N/A	N/A	N/A	N/A	N/A	U	Y	Y	U	Y
Bullock-Palmer, Weiss, Hyman ³⁴	N/A	N/A	N/A	N/A	N/A	U	U	Y	Y	U
Collins, MacLellan, Gibbs, MacLellan, Fletcher ¹	N/A	N/A	N/A	N/A	N/A	U	U	U	Y	Y
Dobesh & Stacy ⁴³	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y
Duff, Walker, Omari ²⁹	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y
Gaylis, Van, Daneshvar, Gaylis, Gaylis, Sheela, Stern, Hanson & Sur ³²	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y
Janus, Bassi, Jackson, Nandurkar, Yates ⁴⁰	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y
Kent, Nadarajan, Akasheh, Sulaiman, Karim, Cooney, Lane, Moloney ⁴⁵	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y
Lees, McAuliffe ³⁰	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	N
Li, Walker, McInnes & Duff ³⁶	N/A	N/A	N/A	N/A	N/A	Y	U	U	U	Y
Moote, Englesbe, Bahl, Hu, Thompson, Kubus,	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	N

Campbell Jr ⁴²											
Novis, Havelka, Ostrowski, Levin, Blum-Eisa, Prystowsky & Kibbe ⁴¹	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y	Y
Schiro, Sakowski, Romanelli, Jukes, Newman, Hudnut & Leonard ³⁵	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	N	N	
Sharif-Kashani, Raeissi, Bikdeli, Shahabi, Behzadnia ³¹	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y	Y
Shedd, Franklin, Schumacher & Green ³⁹	N/A	N/A	N/A	N/A	N/A	Y	U	Y	Y	Y	Y
Sobieraj ³³	N/A	N/A	N/A	N/A	N/A	Y	Y	Y	Y	Y	Y
%	0.0	0.0	0.0	0.0	0.0	81.25	75.0	87.5	81.25	75.0	

Y=Yes; N=No; U=unclear; N/A=Not applicable

Table 4 Results of critical appraisal of Comparable Cohort/Case control studies using JBI-MAStARI

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Table 5 Results of critical appraisal of Comparable Descriptive/Case series using JBI-MAStARI

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Table 6 Results of critical appraisal of qualitative studies using JBI-QARI

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Chapman, Lazar, Fry, Lassere, Chong ⁴⁶	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Cook, Tkaczyk, Lutz, McMullin, Haynes, Douketis ⁴⁷	U	Y	Y	Y	Y	N	N	Y	Y	Y
%	50.0	100.0	100.0	100.0	1000	0.0	0.0	100.0	100.0	100.0

Y=Yes; N=No; U=unclear; N/A=Not applicable

Chapter 4 Findings from Individual Studies

4.1 Review Findings/Results

This chapter will discuss compliance in the included studies with VTE clinical practice guidelines and provide the quantitative evidence included in the review with the findings from each quantitative study identified. There will also be an identification of the findings from the qualitative studies included in the review.

4.1.1 Compliance with VTE guidelines

The three best practice evidence-based national guidelines from America, England and Australia and New Zealand all have similar recommendations,^(46, 49, 53) as described in Chapter 1 section 1.6.2. They all agree that it is important to provide appropriate prophylaxis for VTE as this will reduce the morbidity and mortality from this condition, and ultimately reduce the cost of diagnosis and treatment in the long term.^(46, 49, 53) The American ACCP guideline was utilised by ten different studies^(66, 68-70, 72, 75-78), the Australian and New Zealand guideline was utilised by three difference studies^(64, 71, 81) and the United Kingdom expert working group guidelines were mentioned by one study.⁽⁶⁵⁾ The other studies either did not identify the guidelines used,^(80, 82) or reported the guidelines being used as being hospital guidelines,⁽⁷⁴⁾ evidence based consensus guidelines,⁽⁶⁷⁾ venous thromboembolism prevention guidelines,⁽⁴⁾ or existing consensus guidelines.⁽⁷⁹⁾

Estimates of overall compliance with VTE guidelines varied across the studies and ranged from 6.25%⁽⁶⁵⁾ to 70.4%⁽⁶⁶⁾, as a baseline which increased to 62.5%⁽⁶⁵⁾ to 78.1%⁽⁶⁶⁾ at follow up, following an intervention of various types. See Appendix VII for an overview of the levels of compliance and percentage of change in compliance for each study.

4.2 Quantitative evidence included in the review

4.2.1 Findings from Al-Tawfiq & Saadeh⁽⁷²⁾

This study was a quasi-experimental pre-test post-test study conducted in Saudi Arabia. It was not reported whether the study was conducted in a metropolitan or rural facility only that the study was conducted within a medical services organisation. The healthcare professionals involved in the study were physicians. Best practice guidelines used were the ACCP⁽⁴⁹⁾ guidelines. The type of intervention used were, physician education provided on guidelines for VTE prophylaxis which led to the development of a VTE protocol. There was weekly monitoring of compliance with physicians being

emailed when VTE prophylaxis was not prescribed, the follow up intervention was assessing the prophylaxis provided and its indication. High risk patients were screened by a computer program and physicians of those not receiving prophylaxis were issued an alert. Compliance with VTE prophylaxis was assessed weekly over 14 weeks and all admitted medical patients were assessed for the risk of VTE during the study period, this information was collected weekly and 560 general medical patients met the criteria for prophylaxis during this time. The baseline compliance to clinical practice guidelines was 63% (14 of 22) and after the intervention was introduced this increased to 100% (39 of 39). The duration of the study was June to December 2008. Hospital acquired deep vein thrombosis (DVT) decreased after the intervention with 0.8 per 1000 discharges in the pre-intervention period (95% Confidence Interval (CI): 0.10–1.53) and 0.5 per 1000 discharges in the post-intervention period (95% CI: 0.01-1.05), and there was a period of eleven months with no DVT's reported during the follow up period.

Barriers to compliance were reported by this study as being the magnitude of the problem (such as VTE incidence and cost) being underestimated and there was a fear of bleeding complications.

Facilitators to compliance were reported by this study as being the multiple interventions used to improve compliance which were: physician education, daily reminder emails to physicians and VTE prophylaxis information being incorporated into the weekly round.

4.2.2 Findings from Baroletti et al⁽⁷⁹⁾

This was a cohort study set in Boston, Massachusetts (USA) and was conducted in a metropolitan hospital. The healthcare professionals involved in this study were physicians. The study states it used 'existing consensus guidelines' for VTE compliance, however the evidence base for these guidelines was not specified. The intervention used was a computerised system that identified if a patient fell into the high risk category for VTE and identified if they were receiving prophylaxis. For those not receiving prophylaxis an electronic alert was sent to the physician responsible for the patients care. The alert that was sent to the physician explained the risk identified and advised to initiate prophylaxis. The physician then had the opportunity to order prophylaxis or withhold it on the same screen. There were 866 patients identified as being at high risk for developing VTE and receiving no prophylaxis. This study compared clinical outcomes and VTE prophylaxis rates of the study cohort of patients with one involved in a prior randomized controlled trial completed previously at this site (control group). To assess if there were any incidences of DVT or Pulmonary Embolus (PE) there was a follow up ninety days after the

intervention. The intervention group showed that approximately 9.1% of high risk patients did not receive prophylaxis compared with 18% in the control group. Of the 9.1% of high risk patient in the intervention group, the majority (82%) of patients were from the medical speciality, with the remaining 18% being from surgical or trauma areas. When assessing physician responses to the electronic alerts, there was 37.7% of patients in the cohort study and 33.5% of patients in the historical group, that resulted in prophylactic measures being provided. When assessing for symptomatic DVT or PE at the 90 day follow up, the incidence was 5.1% in the intervention group and 4.9% in the control group. However mortality at 30 days for the intervention group was 113 deaths and the control group had 174 deaths. The most notable discovery reported by this study was the 50% reduction in the number of high risk patients who did not receive prophylaxis. The authors felt this occurred as a result of sending electronic reminder alerts to physicians responsible for patients care. An estimate of the absence of VTE at 90 days post intervention was conducted with the results for the cohort group being 94.1% (95% CI: 92.5-95.4) and the historical group were 94.3% (95% CI: 92.4-95.7) (P=0.95). The duration of the study was from January 2004 to July 2006.

Barriers to compliance identified by this study as being concerns about bleeding or drug-drug interactions with anticoagulants, different computer languages and database layouts not being compatible for the developed program, a lack of integrated data systems, different terms being used to identify patients at high risk for VTE and no prophylaxis provided.

Facilitators to compliance were reported by this study as being computerised electronic alerts being developed and integrated into the electronic patient records.

4.2.3 Findings from Bullock-Palmer, Weiss and Hyman⁽⁶⁹⁾

This study was a quasi-experimental pre-test post-test study in a metropolitan hospital in New York (USA) and was identified as an urban tertiary care teaching hospital. The healthcare professionals involved in the study were physicians. The best practice guideline utilised in this study were those of the ACCP.⁽⁴⁹⁾ The interventions were described as a 'three tier approach' with provider education monthly, reminders with decision support, audit and feedback. This was developed into a cycle that occurred every three months. They used this approach for four years and assessed the incidence of hospital acquired DVT and DVT prophylaxis. DVT prophylaxis was added to the patient pre-printed admission form in the assessment and plan section. At the beginning of each staff rotation there was a handout provided to all house staff about DVT prophylaxis. A pocket DVT prophylaxis guideline card was developed and it contained information on DVT prophylaxis guidelines as well as a suggested regimen

for medical patients. There were monthly audits assessing the rate of DVT prophylaxis for each medical service team. There were a total of 70 charts reviewed for this audit each month to assess if those at risk of developing a DVT were receiving appropriate prophylaxis. DVT prophylaxis rates in the general medical areas were reported back to staff each month at the morbidity and mortality conference. The base line DVT prophylaxis rate (number of patients receiving appropriate VTE prophylaxis) was 63% (2002) and increased each year of the study (2003) 73%, (2004) 90% to (2005) 96% at the end of the study period, which was over four years. Initially there were 14 reported cases of hospital acquired DVT with only one reported case in the last year of the study. During the four years of the study there were a total of 38 reported cases of hospital acquired DVT with 24 of those cases not receiving prophylaxis at all. The rates of hospital acquired DVT were at baseline in 2002 with 2.6 per 1000 discharges (95% CI: 1.5-4.4), in 2004 there were 1.1 per 1000 discharges (95% CI: 0.5-2.3, P=.058) and in 2005 there were 0.2 per 1000 discharges (95% CI: 0.0-1.1, P=.007)

Barriers to compliance identified by this study as being a lack of physician awareness, physicians disagreeing with guidelines and no feedback on outcomes locally.

Facilitators to compliance were reported by this study as being provider education with a reminder system and prophylaxis decision support, as well as this there were audits conducted with team specific feedback that was used to reinforce, and demonstrate that effective change was occurring.

4.2.4 Findings from Collins et al⁽⁴⁾

This quasi-experimental pre-test post-test study was undertaken in a metropolitan hospital in Brisbane, Australia. The healthcare professionals involved were nurses. The best practice guidelines were identified as 'VTE prevention guidelines', however the evidence base for these guidelines were not reported. The intervention aimed to facilitate a change in VTE prevention practices by empowering nurses to be responsible for assessment and prevention of VTE. A position for a VTE Clinical Nurse Consultant was developed to implement a prophylaxis program in conjunction with a vascular physician. This nursing position was responsible for providing staff education on VTE prevention, they carried out regular case notes audits and provided feedback on rates of appropriate VTE prophylaxis. A nurse education package was developed and then conducted face-to-face twice each year at six monthly workshops, self-directed learning packages, small group sessions and module based education. The VTE Clinical Nurse Consultant was also responsible for providing reminders both paper based and personal to responsible staff. The nurse education was designed to up skill nursing staff and empower

them to be able to initiate mechanical prophylaxis, advocate for chemical prophylaxis and be able to identify patients at risk of VTE. The nurses working in the pre-admission clinic were responsible for providing patients with VTE education and empower them to discuss prophylaxis with their doctor. The study ran over four years with annual clinical audits to assess the effectiveness of the interventions. During the four years 2063 medical records of patients were audited, this was broken down by year and was structured with the following, 2005 had 345, 2006 had 401, 2007 had 520, 2008 had 359 and 2009 had 438 medical records audited, and of this number 62% were from the medical speciality. The baseline compliance with VTE assessment and prophylaxis was 27% and at the end of the study it was 85%, with this being across both medical and surgical areas. The study reported that all yearly results were able to show a statistical significance of $P < 0.000.1$ in comparison to the 2005 baseline, and no CI was reported.

Barriers to compliance identified by this study as being the assessment of patients who may be at risk was not being undertaken regularly, and VTE prevention guidelines were not routinely entrenched into clinical practice.

Facilitators to compliance were reported by this study as being the employment of a VTE Clinical Nurse Consultant who would provide a focus on increases the knowledge and skills of nurses in VTE recognition and management by empowering nursing staff in the role of VTE prevention and management.

4.2.5 Findings from Dobesh & Stacey⁽⁷⁷⁾

This quasi-experimental pre and post study conducted in a metropolitan hospital in the USA. The hospital use for the study was described as a community teaching hospital however no actual location was identified with one author located in Omaha and the other two from Missouri. The healthcare professionals involved were nurses, pharmacists and physicians. The best practice guidelines they used were the ACCP.⁽⁴⁹⁾ The intervention was an education program where they focussed on medically ill patients and the importance of VTE prophylaxis, with appropriate prophylaxis and underutilisation in medical patients also reported. This education was provided to different healthcare clinicians in face to face sessions at four different times for each of the six different nursing divisions, four presentations to house staff and four presentations to pharmacy, and six further presentations to different physician meetings. Other education provided was a newsletter sent to 260 physicians who had practice privileges at the hospital, as well as discussions at the quality assurance meetings. The other intervention was for pharmacists to participate in rounds on the wards to provide recommendations to

the need for VTE prophylaxis and what types would be appropriate. Initially at baseline 437 and post intervention 377 patient records were identified for the study, after eligibility criteria there were 344 patients in the pre-education group and 297 in the post education group that were audited for VTE prophylaxis. The assessment of compliance to prophylaxis was identified as 43% in the pre-intervention group and increased to 58% in the post intervention group. Suitable prophylaxis improved from 38% in the pre-intervention group and 49% for the post intervention group and optimal prophylaxis was 11% in the pre-intervention group and 44% in the post intervention group. The study provided evidence of a relative increase in VTE prophylaxis being used by 26% ($P<0.001$) and a relative increase in appropriate VTE prophylaxis usage by 22% ($P=0.006$), there was no CI identified. The timeline for the study was June 2002 to June 2003.

Barriers to compliance identified by this study as being lack of knowledge and awareness of physicians about VTE risk assessment and prophylaxis as well as limitations with administrative costs of the educational interventions

Facilitators to compliance were reported by this study as being face to face sessions for one person to small groups providing educational presentations, newsletters were mailed to 260 physicians who had practice privileges at the hospital. Other facilitators were discussions at quality assurance meetings and pharmacists participating in doctor's rounds to provide immediate pharmacological knowledge.

4.2.6 Findings from Duff, Walker & Omari⁽⁶⁴⁾

This quasi-experimental pre and post study was conducted in a private metropolitan hospital in Sydney, Australia. The healthcare professionals in this study were nurses (360), pharmacists (6) and physicians (210). The best practice guidelines used were the Australia & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism.⁽⁴⁶⁾ Four main barriers to compliance with VTE clinical practice guidelines were identified prior to the study and the interventions were developed to address these barriers. A baseline audit was conducted with this study and a follow up audit was conducted in the middle with the results being relayed back to clinical staff. A VTE risk assessment tool was developed for clinicians to use with guidance included for prophylactic measures. Another intervention was risk alert stickers being attached to patient charts to remind clinicians to assess patients and provide prophylaxis. Staff awareness sessions were provided on VTE and this was run in conjunction with a conference which provided guest speakers on the subject of VTE prevention. A VTE prevention policy was also developed identifying roles and responsibilities of clinicians to ensure clarity

of VTE management. There were 149 patient case notes audited between the pre and post intervention audits. The compliance in providing appropriate VTE prophylaxis was 49% in the pre-intervention group and 68% in the post intervention group ($P=0.02$). There was also an increase in patients assessed for their VTE risk with the baseline being 0% to the post intervention being 35% assessed ($P<0.001$). There was no CI identified and the study timeline was from September 2008 to August 2009.

Barriers to compliance identified by this study as being identified as a lack of motivation by healthcare professionals to change practice to include VTE prevention and management, there were no tools for undertaking a VTE risk assessment or decision support for prophylaxis, therefore providing a lack of system support to clinicians. There was also a lack of awareness and knowledge in regards to VTE prophylaxis as well as clinicians disputing the evidence.

Facilitators to compliance were reported by this study as being feedback to clinicians of the baseline audit as well as an audit conducted midway in the study. Tools developed to support clinicians with risk assessment and decisions on appropriate prophylaxis initiation. Education sessions provided face to face to clinicians to deliver VTE awareness as well as organisation policy development which outlined clinician roles and responsibilities.

4.2.7 Findings from Gaylis et al⁽⁶⁷⁾

This quasi-experimental pre and post study was conducted in a metropolitan hospital in San Diego, California in the USA. The healthcare professionals involved were physicians (61). There was no identification of which guidelines were used they were only identified as 'evidence based consensus guidelines' and what the evidence base was used to guide these was not reported. The study compared physicians using standardised evidence-based medical orders (SEBMO) with physicians using handwritten orders. The pre-printed orders provided information that was evidence-based to physicians about prescribing appropriate prophylaxis. The physicians received education about VTE prophylaxis by emails, newsletters and at grand rounds. All physicians were provided with the VTE risk assessment tool, other VTE educational materials, and the elements of the SEBMO. The study included a total of 498 medical records of patients in the audit this was made up of 249 with handwritten orders and 249 using the SEBMO. The study identified that 70% of the time clinicians using the SEBMO VTE prophylaxis was ordered whereas only 22% of physicians using handwritten orders provided VTE prophylaxis. The study found that in one instance where 62 patients were admitted, 51 were treated with hand written orders and of these only 10 received VTE prophylaxis. Of the remaining 11 patients who were treated using the SEBMO 10 received prophylaxis. The length of stay (LOS) in hospital for patients

with handwritten orders was longer than for patients with SEBMOs ($P=.001$). Patients whose LOS was greater than seventy two hours were 2.01 times more likely to receive prophylaxis than patients with a shorter LOS (95% CI: 1.21-3.32). The study was conducted from March 2006 to June 2006.

Barriers to compliance identified by this study as being attributed to physician oversight of prophylaxis.

Facilitators to compliance were reported by this study as being provision of enhanced educational sessions with the provision of protocols to implement VTE prevention and management.

4.2.8 Findings from Janus et al⁽⁷⁴⁾

This study was a quasi-experimental pre and post study conducted across six hospitals within Australia. Location of the hospitals was not reported and therefore, it is unclear whether the hospitals were in metropolitan or rural areas. The healthcare professionals involved were medical practitioners. The evidence based guidelines used were referred to as local hospital guidelines without providing information on what the evidence base was for them. Each site conducted a case notes audit on either 120 or 240 patients at both baseline and post intervention audits. The post intervention audit was conducted from five months and no more than ten months after the baseline audit. There were 1206 patients in the baseline audit which was made up of 402 medical, 404 surgical and 400 orthopaedic patients. The post intervention audit was conducted on the medical records of 1200 patients and was made up of 401 medical, 298 surgical and 401 orthopaedic patients. Four of the hospitals conducted the audit on 240 patient pre and post and the other two hospitals conducted it on 120 patient's pre and post. The numbers of patient records audited were based on the hospitals ability to conduct the audit in the timeframe needed for the study. In the pre-intervention audit 66.8% of all patients were treated according to guidelines and 63.5% of those patients assessed as being at high risk were receiving VTE prophylaxis. In the post intervention audit the study reported that 71.8% ($P<0.05$) of all patients were receiving VTE prophylaxis and 74.2% ($P<0.03$) of those assessed as being at high risk were being treated according to VTE guidelines. The intervention utilized was an electronic VTE risk assessment system. This system supported the clinicians to classify if a patient's VTE risk fell into the category of either high or not high. This was assessed according to the hospital VTE guidelines. This system also identified if a patient had not been risk assessed and medical officers were provided with education on how to use the system as well as general information on VTE prophylaxis. There was a variable use of the electronic risk assessment tool with one hospital not using it at all and another using it to assess two thirds of their patients. The adjusted odds ratio (AOR) of being treated according to clinical practice guidelines as part of the audit increased by 1.27 (95% CI: 1.07-1.49) which indicated that patients in the

post intervention audit had higher odds for receiving appropriate prophylaxis than those in the baseline audit. This was similar for the patients assessed as being at high risk with the AOR being 1.65 (95% CI: 1.37-1.99, $P < 0.05$).

Barriers to compliance identified by this study as being that software issues were related systems not being able to sustain the electronic intervention, and that the hospitals VTE risk assessment was a separate stand-alone application and not integrated into the patient admission system.

Facilitators to compliance were reported by this study as being implementing an electronic VTE risk assessment tool and providing education on its use to clinicians.

4.2.9 Findings from Kent et al⁽⁷⁸⁾

This quasi-experimental pre and post study was based in a metropolitan hospital which identified as a University teaching hospital, the hospital location was not reported, however the authors are from Ireland. The healthcare professionals involved were medical officers and the ACCP⁽⁴⁹⁾ evidence-based guidelines were used. At baseline 150 patients were assessed for VTE prophylaxis and 150 at the post intervention audit. Compliance with the VTE clinical practice guidelines in the pre-intervention audit showed that 48% of patients assessed as being “at risk” were prescribed prophylaxis, and post intervention rate of VTE prophylaxis improved to 63% ($P = 0.001$). There was no CI identified and the study audited patient notes prior to the intervention and one month after the intervention. The initial intervention was to notify all of the medical teams that there would be an audit on VTE prophylaxis prescribing. This was followed by information being provided to clinicians on VTE prophylaxis and indications for use, as well as educational literature and reminders being placed in areas around the hospital.

Barriers to compliance identified by this study as being patients admitted to acute medical wards or under acute medical teams as they were less likely to be prescribed prophylaxis.

Facilitators to compliance were reported by this study as being the provision of education to clinicians responsible for acute medical patient as well as conducting regular audits.

4.2.10 Findings from Lees & McAuliffe⁽⁶⁵⁾

This was a quasi-experimental pre and post study conducted in a metropolitan hospital in Birmingham, England. The healthcare professionals involved were nurses, junior doctors, consultant and healthcare assistants. The evidence based guidelines used were 'Expert Working Group on the prevention of VTE in hospitalised patient's recommendations'.⁽⁵³⁾ Audits were conducted before and after the intervention with baseline compliance 6.25% (2) and the post intervention compliance was 62.5% (20), with a total of 32 patient notes being audited. There was no CI or P value identified. A nurse was employed one day a week for twenty weeks to assist with increasing compliance with VTE risk assessment, and to ensure appropriate prophylaxis was initiated. There were weekly emails sent to consultants in the medical area with VTE compliance results, this was used to ensure that consultants were responsible for VTE assessment rather than leaving it for junior doctors. This was due to junior doctors being transient while the consultants were permanent team members. Other interventions included in this study were education sessions in a one to one setting and group sessions. Healthcare assistants were practitioners involved in educating patients about VTE prevention and management. Screen savers were developed to prompt clinicians to risk assess patients for VTE and a pharmacist was involved with developing support for nurses to administer thromboprophylaxis and increase their responsibility in this aspect of patient care. The timeline for the study was November 2008 to June 2009.

Barriers to compliance identified by this study as being that healthcare professionals were unaware of the mandatory requirement for VTE management, there was also confusion regarding when to prescribe thromboprophylaxis. It was reported that nurses ignored the risk assessment as they viewed the role was one for the doctor. It was also mentioned that if a patient was deemed too ill to assess the decision was deferred and at times was not considered clinically significant as the presenting condition took priority. Another barrier identified was that staff were too busy and since it was not integrated into the patient assessment would not be initiated. If a patient presented with a contraindication to prophylaxis the risk assessment was not completed and was not repeated if the patient's condition changed. There was no staff deemed to be directly responsible for completing the VTE risk assessment and initiating prophylaxis so it was overlooked.

Facilitators to compliance were reported by this study as being put under four categories, the first was visual strategies where there were screensavers for computers, posters and leaflet distribution with laminated reminders and information provided verbally to patients. The second was educational strategies where education was provided to clinicians and patients, with the third being staff supporting strategies, which include prompts at ward rounds, including pharmacy staff, and providing motivation

and encouragement to clinicians completing assessments. The fourth category was management strategies where VTE was discussed at management meetings, data was distributed to staff and the development of a patient group direction in VTE prevention and management.

4.2.11 Findings from Li et al⁽⁷¹⁾

This was a quasi-experimental pre and post study in a metropolitan private hospital in Sydney, Australia. The healthcare professionals involved were nurses and the ANZ Best Practice VTE prevention guidelines⁽⁴⁶⁾ were used. The intervention utilised was an educational outreach visit (EOV). This consisted of one on two or three nurses in brief (15 minute) educational sessions within their own workplace. Each nurse received two EOV's within twelve weeks and were provided with handouts to support the sessions. There is varied information provided in these sessions from providing data on how to improve their practice, feedback on their own performance or how to approach obstacles to practice change. The nurses were informed about how to assess the patient's risk factors, VTE prophylaxis and the importance of applying the prophylaxis. Medical records of 33 patients were audited at baseline and 36 post the intervention with compliance of appropriate mechanical prophylaxis at baseline being 59.4% and after the intervention was 75%. Patients who had their VTE risk status documented in their medication chart was at baseline 0% and post intervention 28% ($P=0.001$), no CI was identified. The timeline for this study was April to August 2009.

Barriers to compliance identified by this study as being the starting of mechanical prophylaxis being affected by doctors ordering chemical prophylaxis and nurses therefore not considering the use of both for prophylaxis.

Facilitators to compliance were reported by this study as being educational outreach visits where VTE education was provided face to face in the clinicians own environment.

4.2.12 Findings from Maynard et al⁽⁸⁰⁾

This descriptive/case series was undertaken in a tertiary care academic medical centre in metropolitan USA. The specific location was not identified however the authors were all located in San Diego, California and the study was approved by the University of California in San Diego. The healthcare professionals involved were pharmacy residents, house staff, medical staff attending physicians and nurses. The study developed and implemented a standardised VTE prevention protocol but did not report which guidelines were used to inform the development of this tool. These standardised order sets

provide physician guidance on prophylaxis. There were 2924 patient case notes randomly audited during the study equalling a mean of 81 audits per month. The total number of case notes audited was broken down by year and consists of the following, 2005 had 1279, 2006 had 960 and 2007 had 679 patient case notes audited. Compliance with clinical practice guidelines at baseline in 2005 was 58%, in 2006 was 78% and at the end of the study in 2007 this increased to 93% ($P<0.001$) (Relative benefit 95% CI 2005: 1, 2006: 1.28-1.43, 2007: 1.52-1.69, $P<0.001$). There were also reductions for the risk of hospital acquired VTE with a Risk Ratio=0.69 (95% CI: 0.47-0.79) and preventable hospital acquired VTE Risk Ratio=0.14 (95% CI: 0.06-0.31). Members of the multidisciplinary team presented information on Hospital Acquired VTE and the VTE prevention protocol at medical and surgical grand rounds, teaching rounds and noon conferences averaging one educational session per quarter, feedback and education provided to physicians and nursing staff. The timeline for this study was thirty six months from 2005 to 2007.

Barriers to compliance identified by this study as being a lack of familiarity with VTE guidelines or a disagreement with them. There was an underestimation of VTE risk and clinicians having concerns over patients bleeding risks. Clinicians were under the perception that the guidelines were difficult to use and resource intensive making them challenging to use. It was also identified that there was confusion about how to use the risk assessment model.

Facilitators to compliance were reported by this study as being the provision of a standardised VTE prevention protocol with education on how to use it. It was identified that multiple interventions were the best way to facilitate an improvement in compliance which included a method to prompt clinicians to assess patients for VTE risk, standardised options to assist with selection of appropriate prophylaxis.

4.2.13 Findings from Moote et al⁽⁷⁶⁾

This quasi-experimental pre and post study was conducted in a metropolitan hospital in Michigan, USA. The healthcare professionals involved were identified as PA, the meaning of this was not identified in the study, however one of the authors was a Physician Assistant, therefore this is most likely to describe the participants. The evidence based guidelines used were the ACCP⁽⁴⁹⁾ and the intervention put in place was a VTE risk assessment implemented at pre-operation history taking and incorporated into the work flow of the PA's. The patients included in the study were those attending for surgery, in the pre-intervention group there were 1079 and of these, 512 patients had a VTE risk score of 3 or higher (where 3 and above are high and highest risk and 2 and below represent low risk) and the post intervention group were 967. Compliance with VTE prophylaxis for patients assessed as high risk at

base line was 23.1% and at post intervention was 63.7%. For patients assessed in the highest VTE risk group appropriate prophylaxis at baseline was 29.4% and the post intervention group it increased to 69.5%. The odds ratio of VTE in the pre-intervention group compared to the post intervention group was 1.39 (95% CI: 0.61-3.18, P=Not Significant). The timeline for this study was between July 2005 and June 2007.

Barriers to compliance identified by this study as being that there was an incomplete coding of some patients conditions which lead to them not being assessed for VTE intervention.

Facilitators to compliance were reported by this study as being that identifying PA's as a group that were well positioned to improve patient safety with VTE prophylaxis and therefore making it their responsibility to complete risk assessments and initiate prophylaxis.

4.2.14 Findings from Novis et al⁽⁷⁵⁾

This quasi-experimental pre and post study was conducted in a metropolitan hospital in Chicago, USA. The healthcare professionals involved were physicians and the evidence-based clinical practice guidelines used were the ACCP.⁽⁴⁹⁾ A standardised risk assessment for DVT was developed for the computerised patient record system. This risk assessment was made mandatory as part of the pre-admission testing order set. The physician was given the option to opt out of prescribing VTE prophylaxis however they were required to provide a reason. At baseline medical records of 400 patients were audited and 22% of these contained orders for pharmacological prophylaxis, however of these 37% of orders were cancelled prior to their operation, resulting in only 14% of this group actually receiving pharmacological prophylaxis. After the intervention 377 patients were audited and, 40% (151/377) of patients assessed as needing pharmacological prophylaxis received initial orders with only 9% (14/151) of these orders cancelled prior to their operation leaving 36% (137/377) of patients who were assessed as being eligible for pharmacological prophylaxis and actually receiving it. When comparing prescribing of pharmacological prophylaxis between the baseline and post intervention groups there was an increase of 86% (P<.001). There was also a decrease in the cancellation of appropriate pharmacological prophylaxis prior to operation by 75% (P <.001) which provides evidence that there was a 167% increase in actual prophylaxis provided. The CI was not identified and the baseline study was between March 2007 and July 2007, with the post-intervention audit occurring between September 2007 and March 2008.

Barriers to compliance identified by this study as being differing surgeon or speciality preferences for DVT prophylaxis, where these are different to standards.

Facilitators to compliance were reported by this study as being Computer based VTE risk assessment tool with a decision support system.

4.2.15 Findings from Schiro et al⁽⁷⁰⁾

This was a quasi-experimental pre and post study conducted in a metropolitan community hospital in the USA. The hospital has not been identified however all of the authors were employed in Sutter Health, Sacramento. The healthcare professionals involved were nurses. The ACCP⁽⁴⁹⁾ and Agency for Healthcare Research and Quality (AHRQ) were the best practice guidelines used. During the study 4131 patients were identified as being at high risk for VTE and after excluding those with contraindications for anticoagulation the overall rate of prophylaxis provided was 64.9%. After this evaluation it was identified that there were 15 hospital acquired VTEs. The pre-intervention was a medical chart review of 277 patients that showed a rate of 47.9% patients were ordered prophylaxis. Due to the wide range in the numbers audited at each stage this may not be a true reflection of improvement in compliance with VTE prophylaxis. The interventions were to appoint a nurse case manager responsible for inpatient risk assessment and prevention. This nurse was to be the contact for VTE prevention and assessment for patients, physicians, nurses and pharmacists. The clinician appointed undertook the role as well as their usual responsibilities within the organisation with the VTE nurse case manager role being identified as taking about 25% of the overall duties of the nurse. They then developed an automated risk assessment tool that would identify high risk patients. All patients were assessed using the VTE automated risk tool which was run once a day, Monday to Friday. This assessed all patients whether they were newly admitted or previously assessed to identify if any VTE risk assessment had changed from the previous one. The timeline for this study was from January 1st, 2010 to June 30th, 2010 and there were no CI or P value identified.

Barriers to compliance identified by this study as being healthcare professionals having a decreased awareness of VTE risk factors and rates of VTE locally or nationally, which led to them believing there was not a VTE problem in their practice. Healthcare professionals reluctance to use pharmaceutical prophylaxis due to concerns that the patient will have bleeding problems as well as insufficient knowledge about recommendations for VTE prevention. There was an inconsistency in using the VTE risk assessment between healthcare professionals. The nurse employed as the VTE case manager was only part-time therefore patients who were admitted when they weren't there may be missed or

discharged prior to the nurse returning to the position; it was also identified that the treating physicians may have disregarded the nurse case managers recommendations.

Facilitators to compliance were reported by this study as being that a nurse was employed to be a VTE case manager to be a single point of contact for VTE risk assessment and prevention and to act as a resource for other healthcare professionals and patients with respect to VTE education.

4.2.16 Findings from Sharif-Kashani et al⁽⁶⁶⁾

This was a quasi-experimental pre and post study conducted in a metropolitan hospital identified as being a World Health Organisation collaborating tertiary centre in Iran. The healthcare professionals involved were physicians and the ACCP⁽⁴⁹⁾ guidelines were the evidence based guidelines used. Medical records of 298 patients were audited prior to the intervention and 306 patients after the intervention. The appropriateness of thromboprophylaxis prior to the intervention as determined by the ACCP guidelines was 70.4% with an increase to 78.1% (P=0.03) compliance after the intervention. The intervention initiated was pasting sticker reminders about the significance of VTE prophylaxis as well as hospital acquired thromboembolism on patient files. There were no CI identified and the patient record audits occurred 2 days before the intervention and 2 days after the intervention.

Barriers to compliance identified by this study as being that physicians were not paying attention to the reminder alerts which they identified as being due to excessive workloads.

Facilitators to compliance were reported by this study as being VTE prophylaxis reminders either paper based or electronic, continuing VTE education for healthcare professionals as well as the public, regular audits and feedback to staff to improve awareness as well as identifying barriers and developing strategies to stop them.

4.2.17 Findings from Shedd et al⁽⁷³⁾

This was a quasi-experimental pre and post study conducted in a metropolitan community hospital in Georgia, USA. The healthcare professionals involved were physicians and the ACCP⁽⁴⁹⁾ was the best practice guidelines used. In the baseline audit the medical records of 298 patients were audited and in the post intervention audit 190 medical records were audited. The study reported that in the baseline audit 43% received appropriate prophylaxis, 9% received suboptimal prophylaxis and 48% received no

prophylaxis, and in the post intervention group 76% received appropriate prophylaxis, 4% received suboptimal prophylaxis and 19% received no prophylaxis. This intervention provided a 33% improvement in appropriate VTE prophylaxis being provided. The interventions used were electronic medical record VTE risk assessment tool completed for each patient. A paper document in two sections and placed in charts, medical physicians notified prior to intervention that a risk assessment form would be completed for patients as part of the study. Post intervention patients were 1.8 times more likely to be provided with the appropriate prophylaxis with the baseline group being 2.5 times more likely to receive no prophylaxis. No CI was identified and the audits took place 2 days before the intervention and 2 days after the intervention.

Barriers to compliance identified by this study as being some healthcare professionals reported they did not give VTE prophylaxis to patients and others underestimated patient risk and fear of bleeding.

Facilitators to compliance were reported by this study as being a thrombosis risk assessment tool being completed and placed in each patients charts and a dedicated VTE awareness month to increase knowledge.

4.2.18 Findings from Sobieraj⁽⁶⁸⁾

This was a quasi-experimental study conducted in a metropolitan hospital in Hartford, Connecticut, USA. The healthcare professionals involved were pharmacists, physicians, nurse practitioners, physician assistants, and nurses with the ACCP⁽⁴⁹⁾ being the best practice guidelines used. A risk assessment tool was developed for assessing baseline and post-intervention VTE prophylaxis rates. This tool was pilot tested to assess that it would perform adequately. Using the tool on 53 patient records it was identified that compliance with VTE prophylaxis as baseline was 49%. In the post-implementation audit 48 patients case notes were audited which showed there was a 93% ($P < 0.001$) compliance with VTE prophylaxis guidelines. The intervention was for a message to be displayed to providers on the computerized prescriber order entry (COPE), to remind them to assess patients for VTE risk factors and VTE prophylaxis. Messages were to be provided using certain criteria and this was that the patient was admitted to the pilot floor and that there was no order for VTE prophylaxis. No CI was identified and baseline audits were conducted between July and August 2006 and the program was implemented in March 2007.

Barriers to compliance identified by this study as being the computerized prescriber order entry system was not able to group patients by VTE risk and advise healthcare professionals about appropriate prophylaxis. There were limitations with computer systems and inconsistent use by different healthcare professionals as well as alerts being ignored or disregarded by them.

Facilitators to compliance were reported by this study as being electronic reminders for all patients, multiple sessions of education for healthcare professionals, a pocket card was developed and provided to all health professionals that provided information about VTE risk factors, appropriate prophylaxis regimens and contraindications to management.

4.3 Qualitative evidence included in the review.

See Tables 8 and 10 for barriers and facilitators respectively as identified by the qualitative studies included in this review for extracted findings and their supporting illustrations.

4.3.1 Findings from Chapman et al⁽⁸¹⁾

This was a qualitative study that used descriptive study methods in two metropolitan hospitals in Sydney, Australia. The healthcare professionals involved in the study were doctors and the evidence-based guidelines used were the Australia New Zealand Working Party on the Management and Prevention of Venous Thromboembolism.⁽⁴⁶⁾ The method used was semi-structured interviews conducted face to face. The results were categorised under three themes which were, 'Guidelines: friends or foes, practice culture and fragmentation of care'. 'Guidelines friends or foe' describes the attitudes that healthcare professionals had towards clinical practice guidelines. The views of the participants were that although it was agreed that VTE prophylaxis is important for patients in hospital, rarely were decisions made using evidence-based clinical practice guidelines. Junior medical staff generally deferred their prophylaxis decisions to the preferences of their senior managers. These junior staff members also felt that prophylaxis was prescribed according to a senior healthcare professional's previous experience with a VTE adverse event rather than clinical practice guidelines.

'Culture of Practice' was identified as organisation set norms and attitudes which become the environment for decision making where senior members make practice decisions for the team. Due to this hierarchical team setting junior doctors felt they were powerless to make decisions or follow evidence-based clinical practice guidelines, and they generally adapted their practice to match the senior doctor they were working with at the time.

'Fragmentation of care' is described as where speciality care can lead to prevention roles being unclear. This is where healthcare professionals work within a speciality field and focus only on care specific to that speciality, therefore not considering care that is directly related to it. This means that preventive actions such as that for thromboprophylaxis may be seen as someone else's responsibility and therefore may be overlooked. There were 36% of patients identified as high risk for VTE being overlooked for prophylaxis even though healthcare professionals believed implementation of VTE was appropriate in their facility. In addition to the themes, this study provided some suggested strategies for improving practice however they were not included as part of their findings.

Finding 1: 'Guidelines Friends or foe'

Illustration: 'It's a willy nilly approach to each patient. So its "Oh, this patient is a bit overweight, yeh let's [prescribe] them [prophylaxis]". Or someone else might say, "Oh well, they're a bit overweight, but it's not too bad" and won't [prescribe] them [prophylaxis]. You sort of learn haphazardly who to [treat]. You don't refer [to] protocols to do it.' (Interview 34-Registrar, Medical specialty)

Finding 2: 'Culture of Practice'

Illustration: 'Yeah, I've looked at [the VTE prevention guidelines] a couple of times, mostly though you just get into a pattern of what your bosses like and that's what you end up doing'. (Interview 26-Junior Medical Officer, Surgical ward)

Finding 3: 'Fragmentation of Care'

Illustration: 'Unfortunately what happens sometimes is a patient gets admitted under one [Senior Clinician], gets operated [on] by another; a different registrar comes on to take care of them on the ward – it's like someone will deal with it, not me.' (Interview 34-Registrar, Surgical ward)

Extracted findings and their supporting illustrations from this study are grouped into categories and synthesized findings. Tables 8 and 10 for barriers and facilitators respectively as identified by the qualitative studies included in this review provides the categories, findings and illustrations extracted from the included studies.

4.3.2 Findings from Cook et al⁽⁸²⁾

This was a qualitative study using grounded theory methods in three metropolitan hospitals in Canada. The healthcare professionals involved in the study were nurses (bedside nurses, nurse educators,

nurse clinicians, nurse managers), physicians (attending physicians, physician managers, medical residents), pharmacists (pharmacist managers), hospital administrators and members of the quality improvement team. No specific evidence-based guidelines were identified. The study conducted open ended, one to one face to face interviews. Of the participants in the study 70% felt that healthcare professionals were not concerned enough about prophylaxis for VTE. Participants identified that leaving thromboprophylaxis solely to medical practitioners was not optimal as there was evidence of missed opportunities for care, therefore delegating responsibility for this to other healthcare professionals in the multidisciplinary team, such as nurses and pharmacists would optimise patient outcomes. It was advocated by participants that multiple interventions should be used and aimed at different levels within the healthcare system and identified healthcare professionals, patients and administrators as optimal roles to reinforce or enable clinical practice guidelines.

Finding 4: 'Relying on individual physicians for VTE prevention was regarded as ineffective, since medical patients often do not receive prophylaxis when they should'.

Illustration: 'There's a lot of mavericks out there. They do their own thing, and it has never been a problem. They're not held accountable.' (Quality Improvement Team Leader. p. 271)

Finding 5: 'Several different clinician groups were regarded as being involved in medical thromboprophylaxis.'

Illustration: 'Many people in the healthcare team are involved in [deep vein thrombosis] DVT prevention... at the nurse level, physiotherapy, occupational therapy (in terms of mobility of the patient)... the physician, speciality services like thrombo service, hematology department.' (Nurse Manager. p. 271)

Finding 6: 'Multidisciplinary care can lead to confusion about roles on a team, and unclear accountability, thereby becoming a potential barrier to effective prevention.'

Illustration: 'I think it would be crucial to identify one person responsible rather than indirectly a number of people who would be encouraged... It is probably better if you make one of those targets dependable.' (Physician. p. 217)

Finding 7: 'Some participants thought that just one person should be ultimately responsible for thromboprophylaxis.'

Illustration: '[If] you assign it to one person versus having the accountability spread among [all] those people' then nobody takes accountability.' (Quality Improvement Team Leader. P. 271)

Finding 8: 'Many participants reported that mobilization was important, though difficult to achieve.'

Illustration: 'I think the best way to prevent DVT would be to fully focus on early mobilization, regular physiotherapy; and how a patient returns to regular activities to get them up and around.' (Resident. P. 271)

Finding 9: 'They also expressed uncertainty about whether, and how much, mobilization is enough.'

Illustration: 'Level of mobility is a subjective matter... When it comes to the question of "Well, how mobile is mobile enough?", that's not standardized to my knowledge and is very subjective as far as when to stop it. Is getting up in a chair and wiggling your toes good enough?... or are they running up and down the hall and you have to chase them? Really, what level of mobility is considered the standard for discontinuing DVT prophylaxis? That's the question that comes up repeatedly so I think that's a very large barrier.' (Pharmacy Manager. p. 271)

Finding 10: 'Several logistic barriers associated with antiembolic stockings and pneumatic compression devices were cited, including problems with fit, inconvenience, noncompliance, and cost.'

Illustration: 'I find stockings aren't always measured or worn appropriately. It's difficult; I think every nurse measures them differently. If they're too tight around the thighs they just roll them down. If anything they really constrict any type of circulation rather than promote it. Moon boots ... are all right, but a little cumbersome, more expensive and ... are more geared to specific patients.' (Bedside Nurse. p. 272)

Finding 11: 'Another key barrier was that clinicians are more focused on treating the immediate health care problem precipitating hospital admission than on preventing future complications.'

Illustration: 'Prevention issues are a little bit different than treatment issues... We see ourselves as 'interventionists' more than 'preventionists'.... It's the medical things we tend to deal with immediately and that's often the focus... why the patient is in hospital, rightly or wrongly. Quality... doesn't just include intervention, it includes prevention.' (Nurse Manager. p. 272)

Finding 12: 'Participants indicated that local data on the burden of illness and current utilization of thromboprophylaxis would be helpful.'

Illustration: 'Give feedback to the team and physicians about what the incidence of DVT is. I don't think everybody knows. I don't even know in our hospital what it is. So give feedback to the team about what the incidence of DVT is, how many people are on DVT prophylaxis... and how many people die from pulmonary embolism. If you have those numbers in front of you, then you would have something to aim for.' (Physician Manager. p. 272)

Finding 13: 'Most participants recommended redoubling efforts towards anticoagulant thromboprophylaxis 'a coordinated, system-wide approach across the continuum of care.'

Illustration: 'I think if it's not tackled at the beginning it gets lost in the shuffle. I think if it's something we put into place just like we do when we're getting a history and on anything else. If we start with it [heparin] from day one we'll continue it through right to the end.' (Bedside Nurse. P. 272)

Finding 14: 'Participants suggested a variety of methods to enhance thromboprophylaxis.'

Illustration: 'Every medical patient 18 or older will be given a risk score. Risk stratifying all of our patients with just a simple little tool and considering treatment for those that are of high risk is what we need to do. Reinforcing the education and teaching required for the patients that are at low risk, because we don't need to put everyone on heparin. But anyone could potentially get a clot.' (Nurse Educator. p. 272)

Finding 15: 'Computerized health records and computer decision supports were strongly endorsed.'

Illustration: 'It should be in a computerized system... if it goes into a manual system, paperwork tends to get lost. I think a computerized system would be ideal.' (Pharmacist. p. 272)

Finding 16: 'Leveraging patient or family-mediated interventions to provide reminders was also suggested, given the familiarity of the public with thrombosis.'

Illustration: 'I think the absolute biggest driver from our perspective in admin is always public awareness. The demand for standard service increases the most when the public is aware of it... They ask. Patients are becoming more educated, they use the Internet, they search those things out themselves and they are knowledgeable.' (Hospital Administrator. p. 272)

Finding 17: 'Sufficient human resources to ensure mobilization and profiling thromboprophylaxis during accreditation were regarded as administrative initiatives that could help.'

Illustration: 'We need physio and [occupational therapy] OT. We need more rehab. We need resources. That's what we're lacking. The only physio and OT that comes to our floor is pending discharge. So it's definitely resource-related.' (Bedside Nurse. p. 272)

Finding 18: 'Capitalizing on social forces in healthcare such as patient safety could also galvanize efforts to prevent VTE.'

Illustration: 'From an administrative perspective, the whole concept of preventing complications reduces risk, improves patient safety, reduces length of stay ' all those warm fuzzy things that are attached to providing the best possible care for the patient at the right time.' (Nurse Manager. P. 272)

Extracted findings and their supporting illustrations from this study are grouped into categories and synthesized findings. Tables 8 and 10 for barriers and facilitators respectively as identified by the qualitative studies included in this review provides the categories, findings and illustrations extracted from the included studies

Chapter 5: Synthesis of Findings

This chapter presents the synthesized findings to compliance with VTE guidelines from the quantitative and qualitative studies included in this review, and identifies the facilitators and barriers to that compliance.

5.1 Identification of Barriers and Facilitators to Compliance with VTE Clinical Practice Guidelines

From the quantitative studies nine barriers and nine facilitators were identified. From the qualitative studies, three barriers and three facilitators were identified at the category level. Both barriers and facilitators will be discussed by type of evidence in this section and the following chapter will focus on synthesis of evidence from quantitative and qualitative studies included in this thesis.

5.2 Barriers to compliance with VTE guidelines identified from quantitative studies.

Healthcare professional *lack of attention*⁽⁶⁴⁻⁶⁸⁾ was identified as being a barrier to compliance identified where the studies reported that there was a lack of staff attention to VTE risk assessment and prophylaxis initiation as well as, healthcare professionals not prioritising VTE prevention and management very high on their list of actions to take in relation to patient care. Healthcare professionals appeared to have no motivation to change practice and include VTE as part of their practice. The healthcare professionals stated they were too busy to add this to their practice or they simply forgot to complete the requirements for VTE care. Where there were interventions that provided reminders and alerts to staff they were not paying attention and when questioned stated it was due to excessive workloads.

Lack of awareness^(4, 64, 65, 69-71, 73, 78) was identified as a barrier to compliance with VTE clinical practice guidelines. This category covered staff being unaware of what action they should take if a patient had a contraindication to treatment and therefore just ignored any VTE management or prevention strategies. Staff appeared to not know that there were standards and clinical practice guidelines for VTE or where to find organisation protocols and risk assessment tools to use when admitting a patient. Medical practitioners were also unaware of when to prescribe VTE prophylaxis for a patient. Some healthcare professionals believed that there were no problems in their practice area even though the assessment of patients who may be at risk was not uniformly completed.

Patient factors^(65, 70, 72, 73, 79) were reported as barriers to VTE assessment and prophylaxis in five studies and related to healthcare professional concerns about complications with bleeding. There was also a reluctance to prescribe chemical prophylaxis due to the possibility of an adverse reaction or an interaction with other medication the patient may be taking. Healthcare professionals stated that the patient was too ill at times with the focus on addressing their immediate needs and this led to VTE prevention not being seen as a priority.

Knowledge, experiences with and/or access to computers and databases^(68, 74, 79) was identified as being a barrier by three studies and relates to the finding that some computer applications cannot be used in all hospitals due to software incompatibilities as well as a lack of capability of some systems. Some studies stated that different computer systems used different languages therefore a program developed for one will not work on another.^(74, 79) In another, computer applications were seen to be quite limiting and not capable of carrying out the task required.⁽⁶⁸⁾

Disputing evidence/guidelines^(64, 70, 75) was reported as being a barrier where healthcare practitioners felt that the evidence in the guidelines is incorrect. This was seen as the reason for inconsistency in the use of VTE risk assessment between practitioners as well as between wards, specialties and hospitals.

Lack of documentation^(76, 79) was recognised as a barrier due to coding of patient conditions not being complete and leading to a risk assessment document not being completed. It was also acknowledged that some hospitals use varying terms to categorise their patients being at high risk instead of using standard terms based on evidence-based clinical practice guidelines.

Staff factors^(4, 65, 70) were reported as being a barrier by three studies and describe situations where staff did not know who was responsible for VTE initiatives. One study⁽⁶⁵⁾ reported that nurses did not complete the risk assessment because they felt it was the doctor's responsibility, and another⁽⁷⁰⁾ found that doctors disregarded the recommendations provided by a nurse case manager. In one study⁽⁷⁰⁾ a dedicated VTE clinician was not employed in the role full time therefore any patients discharged during the time the position was not filled missed out on intervention.

Another barrier ascertained was *lack of system support*^(64, 80) which was seen to occur where there were no developed guidelines for VTE within the health service and there were no risk assessment tools to use. There was also confusion with the risk assessment model developed.

The last barrier identified from the included studies was *financial constraints*⁽⁷⁷⁾ where it was stated that the costs associated with providing staff education was limiting, especially since a high amount of studies support continued and regular staff education.

Table 7 provides a summary of the barriers identified from the quantitative studies included in this review.

Table 7 Barriers identified from the included quantitative studies

<i>Barriers identified in quantitative studies</i>	
Barrier	General statements about the barrier
Lack of attention ⁽⁶⁴⁻⁶⁸⁾	<ul style="list-style-type: none"> • Lack of staff attention and prioritisation. • Staff not being motivated to change practice. • Staff considered they were too busy. • Staff forgot to complete a VTE risk assessment. • Staff did not consider it significant to care. • Staff were not paying attention to reminder alerts due to excessive workloads. • Patients admitted to acute medical wards or under acute medical teams were less likely to be prescribed prophylaxis.
Lack of awareness ^(4, 64, 65, 69-73, 78)	<ul style="list-style-type: none"> • Of the standards for VTE prevention • Of what action to take if the patient had a contraindication to treatment. • Knowing when to prescribe VTE prophylaxis. • Lack of awareness of the extent of local and national morbidity and mortality. • Clinicians believed that there weren't any problems in their practice area. • The assessment of patients who may be at risk were not uniformly completed.
Patient Factors ^(65, 70, 72, 73, 79)	<ul style="list-style-type: none"> • Complications with bleeding. • Reluctance to use chemical prophylaxis as there could be an adverse reaction or an interaction with other drugs. • The patient was sometimes too ill and there was a focus on addressing their immediate needs and VTE prevention was not seen as a priority.
Computers and databases ^(68, 74, 79)	<ul style="list-style-type: none"> • Developed computer applications for VTE prophylaxis can't be used by some hospitals due to lack of capabilities of their systems. • Some computer systems use different languages therefore a program developed on one won't work on another. • Some VTE applications were quite limited and staff felt they needed to be able to stratify the patients by VTE risk and provide guidance on appropriate prophylaxis to be used.

Disputing evidence/guidelines ^(64, 70, 75)	<ul style="list-style-type: none"> • Practitioners dispute the evidence used to develop clinical practice guidelines. • Inconsistency in the use of the risk assessment between practitioners as well as between wards, specialities and hospitals.
Lack of documentation ^(76, 79)	<ul style="list-style-type: none"> • Patients were identified as not having a risk assessment for VTE due to coding of their conditions not being complete. • Hospitals use varying terms to identify patients at high risk instead of using standard terms.
Staff Factors ^(4, 65, 70)	<ul style="list-style-type: none"> • Staff didn't know who was responsible for completing a patient's VTE risk assessment. • Nurses were seen to ignore the risk assessment because they identify it as a doctor's responsibility. One study stated it was everyone's responsibility and no-one's responsibility'. • Another hospital found that doctors disregard the nurse case manager's recommendations. • A dedication VTE nurse was only part time and therefore patients were at times discharged before there was an opportunity to intervene.
Lack of system support ^(64, 80)	<ul style="list-style-type: none"> • There were no developed guidelines for VTE within the hospital and no risk assessment tool to use • There was confusion with the developed risk-assessment model (RAM).
Financial constraints ⁽⁷⁷⁾	<ul style="list-style-type: none"> • Costs associated with staff education was cited as a barrier, especially since a high number of studies advocate continued and regular education.

5.3 Barriers to compliance with VTE guidelines identified from qualitative studies.

Two qualitative studies addressed barriers to compliance with VTE Clinical Practice Guidelines. Analysis of those papers resulted in the identification of eleven findings that were drawn together under three different barrier categories. The identified barriers were similar to those identified by the quantitative studies.

The eleven findings pertaining to barriers, were grouped together using the Joanna Briggs Institute QARI tool into categories based on similar meanings and then collectively into a synthesized finding. The first category comprised of four findings and was 'Costs and Priority',^(81, 82) which acknowledged that health professionals were more focused on treating the admission condition than preventing future complications and therefore VTE assessment was overlooked. The studies reported that if VTE prophylaxis was not initiated at the initial stages of a patient admission then it may be overlooked for the remainder of their stay. Under this category it was recognised that where health professional's work within a speciality they became blinded to treatments needed outside of this such as VTE prophylaxis. Anti-embolic stockings and pneumatic compression were seen to provide cost restrictions, difficulties with fitting them, inconvenience and patient non-compliance.

The second category contained five findings was *lack of role identification*^(81, 82) which acknowledged that there were multiple practitioners responsible for a patients care however no-one was undertaking it. With no one person or clinician group being responsible for completing a VTE risk assessment and initiating prophylaxis it was being overlooked. There was a lack of consistency and clarity over responsibility for VTE assessment and prophylaxis, as well as identification about mobilization requirements for patients.

The third category which had two findings accredited to it was *Practice culture*⁽⁸¹⁾ where practice was tailored to what senior members of the team wanted, and junior staff follow this rather than using evidence-based clinical practice guidelines. Clinicians developed their own preferences for prescribing VTE prophylaxis from past experience rather than follow clinical practice guidelines, which leads to them consciously not implementing the guidelines. Other clinicians stated that clinical practice guidelines should be changed to address the patient rather than being use across different patients⁽⁸¹⁾. See Table 8 for an overall summary of barriers to compliance with VTE clinical guidelines including their findings and supporting illustrations.

5.3.1 Synthesised findings: Synthesis 1: Barriers to compliance with VTE guidelines

The three categories of barriers were then drawn together to generate one synthesised finding ‘Barriers to compliance with venous thromboembolism clinical practice guidelines’ on the basis of similarity of meaning. This synthesis reflects that any action or inaction that reduces a clinician’s adherence with evidence-based clinical practice guidelines for venous thromboembolism prevention and management can be viewed as a barrier. The following section shows the synthesised findings and the categories and individual findings that contributed to the synthesised finding.

5.3.2 Category 1: Costs and priority

This category is comprised of four individual findings with each finding and illustration taken directly from the included papers (table 8).

Finding	Category
‘Fragmentation of Care’	Costs and Priority
‘Many participants reported that mobilization was important, though difficult to achieve.’	
‘Several logistic barriers associated with antiembolic stockings and pneumatic compression devices were cited, including problems with fit, inconvenience, noncompliance, and cost.’	
‘Another key barrier was that clinicians are more focused on treating the immediate health care problem precipitating hospital admission than on preventing future complications.’	

5.3.3 Category 2: Lack of an identified role

This category is comprised of five individual findings and each finding and illustration taken directly from the included papers (table 8).

Finding	Category
'Relying on individual physicians for VTE prevention was regarded as ineffective, since medical patients often do not receive prophylaxis when they should'.	Lack of Role Identification
'Several different clinician groups were regarded as being involved in medical thromboprophylaxis.'	
'Multidisciplinary care can lead to confusion about roles on a team, and unclear accountability, thereby becoming a potential barrier to effective prevention.'	
'Some participants thought that just one person should be ultimately responsible for thromboprophylaxis.'	
'They also expressed uncertainty about whether, and how much, mobilization is enough.'	

5.3.4 Category 3: Practice culture

This category is comprised of two individual findings and each finding and illustration taken directly from the included papers (table 8).

Finding	Category
'Guidelines Friends or foe'	Practice Culture
'Culture of Practice'	

Table 8 is a summary table which links the categories of barrier to the study findings and illustrations.

Table 8 Barriers identified from the included qualitative studies, by category, finding and illustrations

Barriers to compliance with venous thromboembolism clinical practice guidelines		
‘Any action or inaction that reduces a clinician’s adherence with evidence-based clinical practice guidelines for venous thromboembolism prevention and management can be viewed as a barrier.’		
Category	Finding	Illustration
Costs and Priority	<p>Finding 3⁽⁸¹⁾</p> <p>‘Fragmentation of Care’</p> <p>(Level 3)⁽⁸³⁾</p>	<p><i>‘Unfortunately what happens sometimes is a patient gets admitted under one [Senior Clinician], gets operated [on] by another; a different registrar comes on to take care of them on the ward – it’s like someone will deal with it, not me.’</i> (Interview 34-Registrar, Surgical ward)</p>
	<p>Finding 8⁽⁸²⁾</p> <p>‘Many participants reported that mobilization was important, though difficult to achieve.’</p> <p>(Level 3)⁽⁸³⁾</p>	<p><i>‘I think the best way to prevent DVT would be to fully focus on early mobilization, regular physiotherapy; and how a patient returns to regular activities to get them up and around.’</i> (Resident. P. 271)</p>
	<p>Finding 10⁽⁸²⁾</p> <p>Several logistic barriers associated with antiembolic stockings and pneumatic compression devices were cited, including problems with fit, inconvenience, noncompliance, and cost.</p> <p>(Level 3)⁽⁸³⁾</p>	<p><i>‘I find stockings aren’t always measured or worn appropriately. It’s difficult; I think every nurse measures them differently. If they’re too tight around the thighs they just roll them down. If anything they really constrict any type of circulation rather than promote it. Moon boots ... are all right, but a little cumbersome, more expensive and ... are more geared to specific patients.’</i> (Bedside Nurse. p. 272)</p>
	<p>Finding 11⁽⁸²⁾</p> <p>‘Another key barrier was that clinicians are more focused on treating the immediate health care problem precipitating hospital admission than on</p>	<p><i>‘Prevention issues are a little bit different than treatment issues... We see ourselves as ‘interventionists’ more than ‘preventionists’.... It’s the medical things we tend to deal with</i></p>

	preventing future complications.’ (Level 3) ⁽⁸³⁾	<i>immediately and that’s often the focus... why the patient is in hospital, rightly or wrongly. Quality... doesn’t just include intervention, it includes prevention.’</i> (Nurse Manager. p. 272)
Lack of Role Identification	Finding 4⁽⁸²⁾ ‘Relying on individual physicians for VTE prevention was regarded as ineffective, since medical patients often do not receive prophylaxis when they should’. (Level 3) ⁽⁸³⁾	<i>There’s a lot of mavericks out there. They do their own thing, and it has never been a problem. They’re not held accountable.’</i> (Quality Improvement Team Leader. p. 271)
	Finding 5 Several different clinician groups were regarded as being involved in medical thromboprophylaxis. (Level 3) ⁽⁸³⁾	‘Many people in the healthcare team are involved in [deep vein thrombosis] DVT prevention... at the nurse level, physiotherapy, occupational therapy (in terms of mobility of the patient)... the physician, speciality services like thrombo service, hematology department.’ (Nurse Manager. p. 271)
	Finding 6⁽⁸²⁾ Multidisciplinary care can lead to confusion about roles on a team, and unclear accountability, thereby becoming a potential barrier to effective prevention. (Level 3) ⁽⁸³⁾	‘I think it would be crucial to identify one person responsible rather than indirectly a number of people who would be encouraged... It is probably better if you make one of those targets dependable.’ (Physician. p. 271)
	Finding 7⁽⁸²⁾ Some participants thought that just one person should be ultimately responsible for thromboprophylaxis. (Level 3) ⁽⁸³⁾	‘[[f] you assign it to one person versus having the accountability spread among [all] those people’ then nobody takes accountability.’ (Quality Improvement Team Leader. P. 271)
	Finding 9⁽⁸²⁾ They also expressed uncertainty about whether, and how much, mobilization is enough.	‘Level of mobility is a subjective matter... When it comes to the question of “Well, how mobile is mobile enough?”, that’s not standardized to my knowledge and is

	(Level 3) ⁽⁸³⁾	very subjective as far as when to stop it. Is getting up in a chair and wiggling your toes good enough?... or are they running up and down the hall and you have to chase them? Really, what level of mobility is considered the standard for discontinuing DVT prophylaxis? That's the question that comes up repeatedly so I think that's a very large barrier.' (Pharmacy Manager. p. 271)
Practice Culture	Finding 1⁽⁸¹⁾ "Guidelines friends or foe" (Level 3) ⁽⁸³⁾	'It's a willy nilly approach to each patient. So its 'Oh, this patient is a bit overweight, yeah let's [prescribe] them [prophylaxis]. Or someone else might say, 'Oh well they're a bit overweight, but it's not too bad' and won't [prescribe] them [prophylaxis]. You sort of learn haphazardly who to [treat]. You don't refer [to] protocols to do it'. (Interview 34: Registrar, Medical speciality. p.4)
	Finding 2⁽⁸¹⁾ 'Culture of Practice' (Level 3) ⁽⁸³⁾	'Yeah, I've looked at [the VTE prevention guidelines] a couple of times, mostly though you just get into a pattern of what your bosses like and that's what you end up doing.' (Interview 26: Junior Medical Officer, Surgical ward. p. 6)

5.4 Facilitators to compliance with VTE guidelines identified from quantitative studies.

A range of strategies were utilized by these studies to facilitate an improvement in compliance, and were found to fall under nine main categories. These were;

Education^(4, 64, 69, 71-74, 77) was identified as a facilitator by eight studies included in the review and ranged from sessions conducted face to face within the hospital as a regular occurrence or once off for clinicians, to education outreach visits that supported the clinicians in their work environment. The second category is *computer applications*^(67, 68, 73-75, 79, 80) with facilitators such as electronic alerts and prompts to remind clinicians being developed, as well as integrating a VTE risk assessment into the electronic patient record and admission system. The third category is *audit and feedback*^(64, 69, 74, 78) where clinical audits were conducted regularly and the results were reported back to clinicians. The fourth category is *reminders*^(64, 66, 72, 77) with facilitators in this category ranging from daily electronic reminders, stickers placed on case notes to newsletters sent directly to all of the physicians with practice privileges at the facility. The fifth category is *multiple interventions*^(71, 78, 80) with interventions in this category employed two or more strategies to improve compliance. This ranged from education, audit and feedback, reminders and allocating a dedicated VTE clinician. The sixth category is having a *dedicated person or clinician group*^(4, 70, 76) which stated that the effectiveness of appointing a person or healthcare group to be responsible for prevention and management of VTE improves compliance with clinical practice guidelines as well as patient outcomes. The seventh category of facilitators is *system support*^(64, 67, 80) where studies identified the effectiveness of providing system supports to conducting VTE risk assessment such as pre-printed orders as well as development and standardisation of care policy, procedures and tools.

The eighth category is defined as *management incorporation*^(72, 77) where the effectiveness of incorporating VTE education and reporting into regular quality meetings and hospital rounds, facilitates an improvement in compliance with clinical practice guidelines. The ninth category is *pharmacy involvement*⁽⁷⁷⁾ where there was compliance improvement when pharmacists were involved in the hospital rounds, as well as the pharmacy department providing prompts for chemical prophylaxis with complications and implications easily available. See Table 9 for a description of facilitators identified.

Table 9 Facilitators identified from the included quantitative studies

<i>Facilitators for compliance identified from quantitative studies</i>	
Theme of Strategy	General statements about the strategy
Education ^(4, 64, 69, 71-74, 77)	<ul style="list-style-type: none"> • Educating clinicians with a focus on improving knowledge and awareness about VTE risk assessment and prophylaxis guidelines. • Supporting clinicians by providing strong, supportive clinical leadership as part of the education stream. • Education outreach visits (EOV) to support clinicians in their work environment to promote compliance. • Conduct a VTE awareness month to improve compliance and promote improved awareness.
Computer applications ^(67, 68, 73-75, 79, 80)	<ul style="list-style-type: none"> • Electronic alerts or prompts on to computer are seen as a good strategy to improve compliance. • Pre-printed order sets which provide the doctor with prompts and information on appropriate prophylaxis. • Integrating the risk assessment electronically with the hospital admission system to promote an improvement in VTE compliance with clinical practice guidelines.
Audit and feedback ^(64, 69, 74, 78)	<ul style="list-style-type: none"> • Clinical audits with regular feedback directly to affected clinicians. • Audits and feedback to clinicians was identified as it increased the clinicians awareness of local statistics on compliance within their hospital or speciality area, and provided them with the opportunity to improve their practice.
Reminders ^(64, 66, 72, 77)	<ul style="list-style-type: none"> • Reminders were seen as a good strategy to improve compliance. • Some forms of reminders were daily email reminders sent to doctors for patients in the high risk category and not put on prophylaxis. • One hospital initiative was to mail newsletters to the 260 physicians who had practice privileges in the hospital. • Other reminders mentioned were stickers placed on case noted of patients needing a risk assessment to be completed.
	<ul style="list-style-type: none"> • Multiple interventions were identified as improving compliance and sustaining the improvement more than only a single

Multiple Interventions ^(71, 78, 80)	<p>intervention.</p> <ul style="list-style-type: none"> • These multiple steps involved combinations of clinician education, reminders and prompts, audits with feedback and standardised options for prophylaxis to assist the clinician to select appropriate care.
Allocating a dedicated person for VTE ^(4, 70, 76)	<ul style="list-style-type: none"> • Appoint a practitioner to be an accountable person to ensure VTE prevention and management was a high priority within the hospital. • The allocated clinician is responsible for organising staff and patient education. • To be a single point of contact for other staff with queries in relation to VTE prevention and management. • Identify a practitioner group to be responsible for VTE risk assessment and management.
System support ^(64, 67, 80)	<ul style="list-style-type: none"> • Provide pre-printed orders from evidence-based information. • Develop hospital wide policies and protocols with assessment tools. • These documentation aids as well as policies being developed in hospitals provide a standardisation of care within a health service.
Management incorporation ^(72, 77)	<ul style="list-style-type: none"> • Incorporate VTE it into the weekly hospital rounds. • Include VTE in the regular quality assurance meetings.
Pharmacy involvement ⁽⁷⁷⁾	<ul style="list-style-type: none"> • Staff pharmacists to participate in doctors rounds. • This provides prompts for doctors to prescribe chemical prophylaxis immediately. • Provides staff with knowledge about appropriate doses, contraindications and interactions straight away.

5.5 Facilitators to compliance with VTE guidelines identified from qualitative studies.

The qualitative studies identified seven findings under three categories with their facilitators to improvement in compliance with VTE clinical practice guidelines, see Table 10 for a list of the findings and their illustrations. These seven findings were grouped together using the Joanna Briggs Institute QARI tool into categories based on similar meanings and then collectively into one synthesised finding. These were closely aligned with the facilitators identified in the quantitative studies. *Allocation of a person or clinician group*⁽⁸²⁾ had two findings and was seen as a facilitator by providing a clear identity for the responsibility for completing VTE risk assessment and prophylaxis. This was seen to facilitate by not only making it clear who will undertake the role but also ensuring it was completed in a timely manner and empowering that person to provide reminders to responsible clinicians to ensure compliance and improved patient outcomes. *Audit and feedback*⁽⁸²⁾ is the second category. This category contained one finding. Participants reported that provision of national and local statistics on morbidity and mortality of VTE and how well their organisation compared, was useful to inform their practice. The third facilitator category which comprised four findings is *system development*⁽⁸²⁾ where development of pre-printed order and screening tools were integrated into a systems approach. This category also includes the finding that other reminders – such as those provided from the patients and family can be useful to clinicians, as well as organisations providing sufficient human resources to support increased mobilisation, such as increased access to physiotherapists. See Table 10 for the findings and illustrations of facilitators identified by the included qualitative studies.

The synthesised finding generated by combining these categories was 'Facilitators to improve compliance with venous thromboembolism clinical practice guidelines'. The overall finding was that any activity that raises awareness, and makes it easier for a healthcare professional to undertake a VTE risk assessment or initiation of prophylaxis, and therefore enhance and improve compliance with evidence-based clinical practice guidelines for venous thromboembolism prevention and management can be seen as a facilitator.

5.5.1 Synthesised findings: Synthesis 2: Facilitators to compliance with VTE guidelines

The three categories of facilitators were drawn together to generate one synthesised finding 'Facilitators to improve compliance with venous thromboembolism clinical practice guidelines' on the basis of similarity of meaning. This synthesis reflects that any activity that enhances and improves a clinician's compliance with evidence-based clinical practice guidelines for venous thromboembolism prevention

and management can be viewed as a facilitator. The following section shows the synthesised findings and the categories and individual findings that contributed to the synthesised finding.

5.5.2 Category 1: Allocation of person/group

This category comprised of two individual findings with the findings and illustrations taken directly from the included papers (table 10)

Findings	Category
'Participants suggested a variety of methods to enhance thromboprophylaxis.'	Allocation of person/group
'Sufficient human resources to ensure mobilization and profiling thromboprophylaxis during accreditation were regarded as administrative initiatives that could help.'	

5.5.3 Category 2 Audit and feedback

This category comprised of one individual finding with the finding and illustration taken directly from the included papers (table 10)

Findings	Category
'Participants indicated that local data on the burden of illness and current utilization of thromboprophylaxis would be helpful.'	Audit and feedback

5.5.4 Category 3 system development

This category comprised of four individual findings and each finding and illustration taken directly from the included papers (table 10)

Findings	Category
'Most participants recommended redoubling efforts towards anticoagulant thromboprophylaxis 'a coordinated, system-wide approach across the continuum of care.'	
'Computerized health records and computer decision supports were strongly endorsed.'	

	System Development
'Leveraging patient or family-mediated interventions to provide reminders was also suggested, given the familiarity of the public with thrombosis.'	
'Capitalizing on social forces in healthcare such as patient safety could also galvanize efforts to prevent VTE.'	

Table 10 is a summary table which links the categories of facilitator to the study findings and illustrations.

Table 10 Facilitators identified in the included qualitative studies with Findings and Illustrations

Facilitators to improve compliance with venous thromboembolism clinical practice guidelines		
<i>'Any activity that raises awareness, and makes it easier for a healthcare professional to undertake a VTE risk assessment or initiation of prophylaxis, and therefore enhance and improve compliance with evidence-based clinical practice guidelines for venous thromboembolism prevention and management can be seen as a facilitator.'</i>		
Category	Finding	Illustration
Allocation of Person/Group	Finding 14⁽⁸²⁾ Participants suggested a variety of methods to enhance thromboprophylaxis. (Level 3) ⁽⁸³⁾	Every medical patient 18 or older will be given a risk score. Risk stratifying all of our patients with just a simple little tool and considering treatment for those that are of high risk is what we need to do. Reinforcing the education and teaching required for the patients that are at low risk, because we don't need to put everyone on heparin. But anyone could potentially get a clot.' (Nurse Educator. p. 272)
	Finding 17⁽⁸²⁾ Sufficient human resources to ensure mobilization and profiling thromboprophylaxis during accreditation were regarded as administrative initiatives that could help. (Level 3) ⁽⁸³⁾	'We need physio and [occupational therapy] OT. We need more rehab. We need resources. That's what we're lacking. The only physio and OT that comes to our floor is pending discharge. So it's definitely resource-related.' (Bedside Nurse. p. 272)
Audit and	Finding 12⁽⁸²⁾	'Give feedback to the team and physicians about

Feedback	Participants indicated that local data on the burden of illness and current utilization of thromboprophylaxis would be helpful. (Level 3) ⁽⁸³⁾	what the incidence of DVT is. I don't think everybody knows. I don't even know in our hospital what it is. So give feedback to the team about what the incidence of DVT is, how many people are on DVT prophylaxis... and how many people die from pulmonary embolism. If you have those numbers in front of you, then you would have something to aim for.' (Physician Manager. p. 272)
System Development	Finding 13⁽⁸²⁾ Most participants recommended redoubling efforts towards anticoagulant thromboprophylaxis 'a coordinated, system-wide approach across the continuum of care. (Level 3) ⁽⁸³⁾	'I think if it's not tackled at the beginning it gets lost in the shuffle. I think if it's something we put into place just like we do when we're getting a history and on anything else. If we start with it [heparin] from day one we'll continue it through right to the end.' (Bedside Nurse. P. 272)
	Finding 15⁽⁸²⁾ Computerized health records and computer decision supports were strongly endorsed. (Level 3) ⁽⁸³⁾	'It should be in a computerized system... if it goes into a manual system, paperwork tends to get lost. I think a computerized system would be ideal.' (Pharmacist. p. 272)
	Finding 16⁽⁸²⁾ Leveraging patient or family-mediated interventions to provide reminders was also suggested, given the familiarity of the public with thrombosis. (Level 3) ⁽⁸³⁾	'I think the absolute biggest driver from our perspective in admin is always public awareness. The demand for standard service increases the most when the public is aware of it... They ask. Patients are becoming more educated, they use the Internet, they search those things out themselves and they are knowledgeable.' (Hospital Administrator. p. 272)
	Finding 18⁽⁸²⁾ Capitalizing on social forces in healthcare such as patient safety could also galvanize efforts to prevent VTE. (Level 3) ⁽⁸³⁾	'From an administrative perspective, the whole concept of preventing complications reduces risk, improves patient safety, reduces length of stay ' all those warm fuzzy things that are attached to providing the best possible care for the patient at the right time.' (Nurse Manager. P. 272)

5.6 Summary of systematic review findings

The quantitative studies identified 9 barriers and 9 facilitators. The barriers were a lack of attention to VTE prevention and management, staff felt they were too busy or forgot to undertake the risk assessment and did not consider it as a high priority or significant to the patients care. Reminders provided were ignored or overlooked being blamed on workloads and some wards appeared less likely to prescribe VTE prophylaxis than others. There was a lack of awareness around the standards for VTE prevention or when to prescribe prophylaxis as well as what prophylaxis is appropriate. There was also inconsistent knowledge about what action to take if there was a contraindication to the prophylaxis. Healthcare professionals were unaware of the local or national morbidity and mortality rates for VTE and were confident that their practice area was providing appropriate care. There were barriers related to the patient where the healthcare professional was reluctant to prescribe chemical prophylaxis in case there was an adverse reaction, and at times the focus was on the patients presenting condition rather than possible preventive actions. Developed computer applications were not always compatible in other areas with differing systems or languages, while staff felt that some applications were limiting as they did not provide guidance on appropriate prophylaxis to be used. Some practitioners disputed the evidence that was used to develop the guidelines and there was inconsistency in their use between healthcare professionals as well as wards, specialities and organisations. Documentation issues are another identified barrier with organisations using different terms to identify patients risk status or coding patient conditions being incomplete. Staff factors such as not having an identified person or group responsible for the VTE risk assessment was another barrier as well as nurses not completing it as they felt it was not their responsibility, while doctors disregarded the nurses recommendations when they had completed the risk assessment. Some organizations did not have guidelines or risk assessment tools for staff to use while others were confused about the tool and how to use it. There was also the identification of staff education costs being a barrier due to the fact that continued education was advised.

The facilitators were regular education to both healthcare professionals and patients to improve awareness about VTE risk assessment and prophylaxis, as well as to support clinicians in their environment. The development of computer applications that will prompt the healthcare professional and provide guidance on appropriate prophylaxis to be integrated into patient admission systems. Regular audits of VTE risk assessment and prophylaxis locally and then the results fed back to healthcare professionals assists them to be aware of local trends. Reminders in different forms were

seen as a facilitator to prompt VTE prevention and management. A single intervention mode was not seen as a facilitator however when multiple interventions were utilized together improvements occurred. Another facilitator was to allocate a dedicated person or professional group for VTE management, this person would be responsible for providing a single point of contact and education for staff and patients. The development of hospital policies and protocols as well as documentation aids was seen as system support to facilitate compliance. Management incorporating VTE as part of their quality assurance as well as involving pharmacy staff were also seen as facilitators.

The qualitative studies identified 3 barriers and 3 facilitators which were closely linked to the quantitative barriers and facilitators. Costs and priority was identified as a barrier where healthcare professionals focus on a patients presenting condition and do not consider or overlook preventive actions. It was also identified that the mechanical prophylaxis could be expensive and there were problems with patient compliance and fitting difficulties. Another barrier was a lack of role identification for someone being responsible for the risk assessment and prophylaxis. The last barrier was practice culture where junior staff felt disempowered to initiate prophylaxis according to clinical practice guidelines where senior team member's preferences differed from these guidelines. Other healthcare professionals developed their own preferences from past experiences rather than follow clinical practice guidelines.

The facilitators were the allocation of a person or clinician group to clearly identify a responsible person to complete the VTE risk assessment and initiate prophylaxis, as well as being a support person for other healthcare professionals. Audit and feedback where an organisation conducts patient case notes audits in relation to assessing healthcare professional compliance with VTE prevention and management, and then results are reported to staff, so that their practice is informed with relevant information. Being provided with local and national compliance rates, as well as morbidity and mortality rates would encourage uptake of the guidelines. The last facilitator is system development where reminders and screening tools are developed and linked to patient records for prompts, ease of use and guidance with what VTE prophylaxis is appropriate.

If a clinical practice area considered the facilitators from both the quantitative and qualitative studies and built these into their practice area there may be a reduction in the barriers affecting healthcare professional compliance with clinical practice guidelines.

Chapter 6: Discussion

This chapter provides the discussion on clinical practice guidelines and compliance with their use by the included studies. It identifies the healthcare professionals involved in the studies, the location of where the studies were conducted, as well as the designs used in developing the studies and the interventions they utilized.

6.1 Guidelines, practice and compliance

Clinical practice guidelines are used by healthcare organisations to improve the quality of care provided and ultimately improve patient outcomes.⁽²⁾ They are specified as statements that are developed systematically, to support healthcare professionals and the patient to make decisions about providing relevant care in different clinical situations.⁽²⁾ Ideally these guidelines are developed from evidence-based sources and provide standardised care to improve quality outcomes for patients.⁽²⁾

The National Institute of Clinical Studies in Australia have explained the importance of identifying barriers when an organisation is striving to make changes to clinical practice.⁽⁵⁶⁾ There are gaps between best practice guidelines and clinical practice and knowing the reason behind this can help organisations develop strategies for increased uptake.⁽⁵⁶⁾ When new clinical practice guidelines are established some healthcare professionals are resistant to the change that accompanies it, understanding these resistances can help to overcome them and improve adherence.⁽⁵⁶⁾ There is a large gap between clinical practice in relation to VTE prevention and management and evidence-based clinical practice guidelines, with this occurring not just in Australia but across the world.⁽⁵⁶⁾ Being able to identify the barriers that impeded the utilisation of clinical practice guidelines is a significant strategy to achieve improved patient outcomes and quality of care.⁽⁵⁶⁾

All quantitative studies identified that there was an improvement in the compliance with clinical practice guidelines after an intervention was provided. The improvement rate for the quantitative studies in level of compliance ranged from 5% to 56.25% (Appendix VII).^(4, 64-80) The majority of interventions provided some form of education or awareness of the need to assess patients for VTE risk and to initiate prophylaxis, either by face to face sessions or reminders on the computer, patient case notes or newsletters. Therefore, interventions that promoted awareness and assist the individual to implement the guidelines easier will lead to an increase in compliance with the guidelines. The review also identified that a once off intervention was not enough to sustain improved compliance. In contrast, multiple modes of delivery at different time intervals are affective in generating a sustained

improvement. Only one study reported complete compliance⁽⁷²⁾ post-intervention, therefore there are still barriers to compliance that either need to be identified or have effective intervention strategies developed and implemented. Making a clear identification of the person or clinician group that are to be responsible for the assessment and initiation of prophylaxis appears to go a long way to supporting the improvement in compliance with guidelines. Another way to improve and sustain the improvement would be to provide VTE champions within each facility or health service area to provide regular education, audits and feedback as well as to keep staff on track with the guidelines. This clinician can then be a point of contact for any practitioner with questions in regard to VTE management and prevention. Until there are clear role allocations and supportive documents either paper based or electronic, compliance may continue to be an issue with VTE prevention and management.

The study that had the greatest impact on VTE compliance was conducted in Australia and the duration of the study was five years, providing evidence that long term intervention is more beneficial for sustained change and improvement.⁽⁴⁾ This study employed a VTE nurse champion who was responsible for conducting regular education with staff including feedback of audit results.⁽⁴⁾ This shows that providing nurses with the knowledge and responsibility for VTE risk assessment and prophylaxis can deliver an improvement in the safety and quality of care provided to patients over time. A study in America that appointed a part-time nurse case manager for a 6 month period reported a 17% improvement in VTE guideline compliance.⁽⁶⁵⁾ This study would be good to follow up by appointing a full-time nurse in the VTE prevention position, and conduct it over a longer period of time. This would help to identify if the compliance percentage can be improved upon with full-time rather than part-time monitoring, and provide evidence of being able to sustain the compliance improvement.

6.2 Type of healthcare professional

There were a variety of different healthcare professionals included in the studies with seventeen providing interventions for physicians, comprising all titles that are used for this position in the different countries including physician assistant.^(64-69, 72-82) Of these seventeen studies, eleven exclusively involved physicians and the other six included multiple healthcare professionals. There were nine ^(4, 64, 65, 68, 70, 71, 77, 80, 82) studies that provided interventions for nurses with three^(4, 70, 71) of these exclusively including nurses.

There were five ^(64, 68, 77, 80, 82) studies that provided interventions for pharmacists or pharmacy staff however none of these were exclusive to this healthcare professional group. There were six ^(64, 65, 68, 77, 80, 82) studies that provided interventions for multiple healthcare professional groups.

It was recognised that even though physicians agreed that VTE prevention and management was important and they were aware of clinical practice guidelines being available they did not use them when providing prophylaxis. The main reason for this was that junior medical staff that followed the preferences of their senior counterparts.⁽⁸¹⁾ The junior staff felt that they were not empowered to make their own decisions using clinical practice guidelines within the organisation, even though they were aware of their existence.⁽⁸¹⁾ Another consideration was the presenting condition of the patients as physicians were concerned about their immediate presenting conditions rather than preventive care by conducting a risk assessment. Some physicians acknowledged that whether to use prophylaxis or not generally depended on past experiences with either adverse events of bleeding or development of a DVT or PE.⁽⁸¹⁾ Junior physicians felt that it was not their responsibility to prescribe prophylaxis unless they were directed to by the senior physician, where the senior physician felt that if they were in the emergency area it should be the admitting ward physician, and the ward physicians stated the physician that saw them initially should be responsible for prophylaxis.⁽⁸¹⁾

Due to these points of view prophylaxis was often overlooked with each physician thinking someone else will, or had addressed it.⁽⁸¹⁾ Physicians have also been observed making judgements on the appearance of a patient, such as their mobility or lack of it or their weight.⁽⁸¹⁾ This therefore means that the physician was not using evidence-based guidelines to ensure all patients are assessed in a standardised way, and were performing it in a more informal and undocumented way.⁽⁸¹⁾

In some areas nurses were empowered to complete the VTE risk assessment and initiate prophylaxis, and others they were educated to support the physician in prescribing prophylaxis.^(4, 71) However there were sometimes obstacles where a nurse was made responsible for VTE management as physicians would disregard the nurses suggestions.⁽⁷⁰⁾ There were also incidents of nurses not considering the use of mechanical prophylaxis because the physician had prescribed chemical prophylaxis and therefore optimal prophylaxis coverage was not achieved.⁽⁷¹⁾

In another study it was identified that nurses did not consider VTE risk assessment or prophylaxis as they felt it was the physicians role not theirs.⁽⁶⁵⁾

Although there were no studies that were solely undertaken on pharmacy staff it was identified that having them available during rounds was a benefit to be able to check appropriate chemical prophylaxis and doses.

6.3 Type of location

The included studies either reported that they were conducted in the metropolitan area or gave no location; therefore there were no included studies that acknowledged they were undertaken in a rural or remote area. About one third of Australia's population live outside of major cities and people in rural and remote areas face a significant health disadvantage.⁽⁸⁴⁾ Small rural and remote communities are identified as having higher hospitalization rates and higher incidence of health risk factors when compared to metropolitan areas.⁽⁸⁴⁾ Therefore it would be beneficial that studies conducted in metropolitan areas were replicated in rural and remote areas to ascertain if the same outcomes would result in these locations.

6.4 Types of Intervention

The two qualitative studies identified very similar barriers and strategies for improvement as the eighteen quantitative studies. The studies discussed the lack of role identification for VTE risk assessment and prophylaxis and acknowledged that there were differences in practice depending on the healthcare team and preferences by their management. When it came to strategies for improvement in VTE compliance, there was an agreement that clearly identifying a clinician or practitioner group to be responsible for the prevention and management of VTE would be beneficial. They identified that if a dedicated person or group were responsible for VTE procedures and protocols then care would be initiated more quickly, and reminders would not be forgotten. However creating a VTE clinical position would not be possible in some smaller organisations and may need to be considered as part of a healthcare professionals role alongside current responsibilities, or where there is more than one organisation within a health service the position may be to oversee multiple sites.

The studies provided evidence that improved compliance with VTE guidelines needs to have multiple interventions, over an extended time to support practice change. The interventions that appeared to be the most beneficial were regular education sessions with feedback from audits, as well as clinician reminders. This three tiered approach, along with support from a dedicated VTE clinician, seem to be the optimal strategies to affect practice change and sustain it for the long term.

Education played an important role in the majority of the studies showing that it is integral in affecting practice change. The education sessions were for healthcare professionals that were directly responsible for patient care and mainly involved doctors and nurses. Education was provided as a timely reminder about VTE prevention and management and was delivered in different formats such as

face to face or posters in the clinical areas, however regular education was seen to be more beneficial than a once only session. It was identified by some studies that providing regular staff education was seen to be quite costly and therefore not continued after the study was complete.

Regular monitoring of compliance with VTE clinical practice guidelines and providing staff with regular updates on local and national statistics that include facility compliance rates, morbidity and mortality would keep practitioners more informed, and therefore lead to a more active participation in VTE prevention and management. There was also a strong use of reminders for healthcare professionals. These reminders were presented in a variety of different forms from generic VTE stickers on all admitted patient case notes to emails sent to each medical practitioner with practice privileges at the hospital, this is generally where a doctor who has a private practice is given permission to admit patients and manage them in the hospital setting, although they are not employed by the hospital.

Providing evidence-based risk assessment tools and pre-printed order forms for prophylaxis, either in hard copy or linked to electronic patient records would improve practitioner compliance. This was by providing system supports that were easily accessible to healthcare professionals to streamline the process rather than add to the workload. Another strategy identified was to provide more allied health staff like physiotherapists to support ward staff and provide qualified assistance with increasing patient mobilisation.

The studies that were conducted for a duration of between two years and five years provided evidence of a compliance improvement ranging from 28.6% to 58%^(4, 69, 76, 79, 80) where the majority of the studies conducted over one year or less ranged from 5% to 22% improvement in compliance.^(64, 70-72, 74, 75, 78) This review provides evidence that shows studies and interventions conducted over an extended period of time are more likely to have a higher improvement rate in compliance with VTE guidelines and in turn more likely to lead to long-term sustainability.

6.5 Study Designs

Of the included eighteen quantitative studies, sixteen used a quasi-experimental pre-test and post-test study design, there was one cohort study and one descriptive/case series. The quantitative approach to research is used to produce information in a numerical way.⁽²⁶⁾ It provides statistics between variables which provides evidence about the strength of those relationships or the significance of them.⁽²⁶⁾ To ensure the validity and reliability of the findings are at the highest level the methods and samples need

to be similar and reflect the same demographics or measurements.⁽²⁶⁾ Quasi-experimental methods of research is where there is an assessment of current practice, an intervention is provided and then an assessment after this intervention is conducted to identify if there was any change in that practice.⁽⁸⁵⁾ The quasi-experimental pre and post-test of the included studies in this review provided an assessment of healthcare professional practice in regards to compliance with clinical practice guidelines for VTE prevention and management. Each study then provided either single or multiple interventions to the healthcare professionals included in the study, and there was a follow-up audit using the same criteria as the pre-test audit to assess whether there was any change in practice. These studies all assessed healthcare professional practice on admitted patients to the healthcare facility that were deemed as being at risk of potentially developing a VTE.^(4, 64-78)

There are a couple of different definitions for a cohort study method, one is where two different groups with similar demographics are compared to assess an identified aspect or action.⁽⁸⁵⁾ Generally one group will have received the intervention and the other would not.⁽⁸⁵⁾ Another definition is where two different groups of participants have the same characteristic or have been exposed to the same disease or drug, and study the groups over the long term.^(17, 26) However the cohort study in this review compared the cohort in their study to a cohort in a previous study undertaken in the same setting with a similar intervention.⁽⁷⁹⁾

The last study in the quantitative section was conducted using the descriptive case series design where behaviour and activities of selected individuals in the research location are identified.⁽⁸⁵⁾ This was undertaken using an observational method where patients within the healthcare setting chosen were observed for the application of appropriate VTE prophylaxis according to the developed clinical practice guidelines.⁽⁸⁰⁾ This was conducted over an extended period and also assessed the incidence of hospital acquired VTE within that time.⁽⁸⁰⁾

There were two qualitative studies included in this review with one using a case study approach and the other using the grounded theory approach. The qualitative approach to research is used to explore the persons view or thoughts on a particular issue. Other aspects investigated with this mode of review are the social and cultural experiences.⁽⁸⁶⁾ Qualitative research methods are optimal for environments where sample size would be insufficient to provide statistically significant results, as well as offering evidence from the participants experiences about whether an intervention is effective or not.⁽⁸⁶⁾ Some areas of research are not appropriate to quantify results whereas assessing the quality of the intervention or outcomes would be more beneficial.⁽⁸⁶⁾ This allows individuals to provide information on their

experiences with language rather than assess by using numbers to provide a statistical outcome.⁽⁸⁶⁾ In other words instead of testing and evaluating it aims to discover, describe and understand a phenomena.⁽⁸⁶⁾

A case study design is used to as one way to collect data that describes thoughts and feelings about places, people or things.⁽⁸⁶⁾ This method has the advantage where a description of feelings about an intervention or concept convey how the individual participants view their experience.⁽⁸⁷⁾ The research using the qualitative case study method in this review used doctors and looked at ascertaining their positions around VTE prophylaxis.⁽⁸¹⁾ This study identified that senior healthcare professionals, were the appropriate positions to affect a practice change in regards to VTE prophylaxis, and that even though this is the case, these people would need to be convinced that compliance with clinical practice guidelines would add value to patient outcomes.⁽⁸¹⁾

Grounded theory is another qualitative research method used by a study include in this review. Grounded theory's main aim is to produce theories in relation to social experiences or incidents, in other words to develop a greater understanding that is 'grounded' in or that which originated from a logical investigation of data, and is 'grounded' in the 'real world'.^(26, 88) This research method is suitable to be used where the reviewer wishes to study social interactions or experiences to clarify a method or practice, and when testing or verifying an existing theory is not required as it provides a platform to build a theory rather than test one.^(87, 88) With this method of research, data is collected and analysed in cycles with each cycle informing the next and sampling not formalised at the beginning of the study, however the data collected will define the boundaries and then direct the theory development.^(26, 88) The primary purpose of data analysis in grounded theory is continuous evaluation.⁽⁸⁸⁾ The study included in this review that used grounded theory conducted the research in three hospitals and conducted interviews with nurses, pharmacists, physicians and hospital administrators, in regards to VTE prevention.⁽⁸²⁾ They discovered that optimal VTE prevention was not always sufficient with either individual physician or multidisciplinary care involvement.⁽⁸²⁾ It was identified that the healthcare professionals interviewed in this study felt that a coordinated, system wide process directed at patients, healthcare professionals as well as administrators would be the best option for VTE prevention.⁽⁸²⁾

Chapter 7 Conclusion

This chapter summarizes the study and based on the synthesis, suggests areas for future research.

7.1 Summary

This thesis and the systematic review that underpins it, has provided evidence that knowledge and awareness about VTE risk assessment and prophylaxis, and the associated clinical practice guidelines are lacking in the acute care sector. Interventions have been shown to improve compliance with VTE clinical practice guidelines, therefore after healthcare professionals have been provided with education on VTE risk assessment and prophylaxis, monitoring of their ongoing compliance would be necessary. At times there will be reasons for not completing a VTE risk assessment on admission, such as where the patient is too sick and immediate interventions are to stabilize their condition or, if there are bleeding conditions that contraindicate prophylaxis. However even taking these issues into account a risk assessment should be completed as soon as practical after a patient has been admitted and stabilized, or if there has been any change to their condition as this may cause a need to change current VTE prophylaxis or lack of prophylaxis. The research studies used for this review show that many different forms of intervention can improve compliance with clinical practice guidelines. These interventions can be developed for the specific audience and setting they are being used for, as well as the fact that not all interventions are appropriate for all areas, such as computer applications not being suitable where system capacity is lacking.

The interventions had a heavy emphasis on education of clinicians as well as patients, and that education should not be a once only episode but should be repeated and continuous. This education should include not only how and when to undertake a risk assessment, what prophylaxis to use and when but also the statistics of local and national morbidity and mortality from VTE so that it can be identified as a priority and relate locally. There was also a high emphasis on improved computer applications to support the clinician in remembering to undertake the risk assessment, how to identify the risk level and understand what prophylaxis is appropriate for that client. It is identified that the computer applications are supported with, or have links to evidence-based best practice guidelines.

Barriers to practitioner compliance with VTE clinical practice guidelines were also varied. The main barriers identified were lack of awareness and staff not prioritizing or paying attending to implementing VTE prophylaxis. There were staff reminder prompts being ignored as well as a lack of awareness of the standards for VTE prevention. Staff were unaware of, or unsure of the appropriate action to take, as

well as knowing what action to take if there are contraindications to the treatment. The lack of awareness also encompassed the statistics, either local compliance of VTE clinical practice guidelines or the morbidity and mortality nationally, which therefore meant that clinicians were not putting it as high on their priority list to address. Another barrier was a fear of patient complications such as bleeding; this therefore shows that these practitioners have a lack of knowledge about the use of and contraindications to chemical prophylaxis. If interventions are appropriately designed taking the barriers into consideration they can overcome these barriers, especially the lack of knowledge or awareness in relation to VTE clinical practice guidelines. This can then provide improved implementation of best practices that are embodied within the guidelines.

7.2 Implications for Practice

Implications for practice and research are based on the levels of evidence developed by the Joanna Briggs Institute.⁽⁸³⁾ The levels of evidence were developed to assess the validity of recommendations made by those appraising current knowledge and gaps in knowledge identified in systematic reviews.⁽⁸³⁾ Appendix VI details the JBI levels of evidence assigned to the following implications for practice and research.

Compliance to VTE clinical practice guidelines can be improved by:

Allocating a dedicated VTE nurse/clinician, either in a hospital or within a health service, to coordinate VTE prevention and prophylaxis strategies is recommended to provide an accessible champion that other clinicians can access when needed. (Level 3)

Regular VTE education provided to all clinicians responsible for patient care to ensure they are aware of the clinical practice guidelines and risk assessment tools within their facility for VTE prevention, provide information on local organisation compliance with VTE clinical practice guidelines and national morbidity and mortality statistics for VTE, provide reminders to risk assess all patients and provide prophylaxis appropriate to their risk level, and what appropriate prophylaxis is for the different risk levels. (Level 3)

Education and review process for VTE needs to be embedded into organizational staff procedures to ensure continuous knowledge updates and reduce incidence of education fatigue. (Level 3)

Healthcare professionals should be aware of the factors surrounding VTE development and prevention strategies, and be able to educate patients and families to be proactive in their own care. (Level 3)

Acute health organization's need to ensure there are system supports in place to provide clinicians with guidelines and risk assessment tools to be able to identify individual patient risk and ensure appropriate prophylaxis initiated. (Level 3)

Organization development of a process for regular audit and feedback to ensure continuous quality improvement. (Level 3)

7.3 Implications for Research

Further research studies, including large, randomized controlled trials, are required in acute hospital settings to examine compliance with VTE clinical practice guidelines in the acute setting. (Level 3)

Further research studies are required in acute hospital settings to determine the optimal frequency and intensity of interventions needed to provide an improvement in compliance without causing a negative reaction by desensitizing healthcare professionals. (Level 3)

Further research studies, including rigorously controlled trials, are required to determine if the rural acute hospital setting has the same barriers and facilitators to clinical practice guidelines. (Level 3)

Further research studies are required to determine the type of electronic interventions that will improve compliance with VTE clinical practice guidelines in specific areas. (Level 3)

Further research studies are required to determine which multiple interventions are appropriate to improve compliance with VTE clinical practice guidelines within the targeted setting. (Level 3)

Further research studies are required to determine the benefits of in-service training versus continuous professional development activity as an intervention to improve compliance with VTE clinical practice guidelines, and whether this is applied as single sessions or continuous, regular sessions. (Level 3)

Further research studies are required to determine if VTE prevention and management should become a compulsory continuous professional development core competency for Healthcare Professional registration. (Level 3)

Further research studies are required to determine the benefits of allocating a full time VTE clinician as an intervention to improve compliance with VTE clinical practice guidelines. (Level 3)

7.4 Limitations of the review

The study designs were limited with randomised control trials being needed to provide a higher level of findings for increasing the reliability of the outcomes.

It appears that the studies were only conducted within the urban setting, and given the differences reported between urban and rural communities for other health issues it is not evident if an estimation VTE compliance is possible across all healthcare areas.

Each study designed their own VTE risk assessment tool therefore the variability between studies may be greater as not all provided the criteria they used within their studies.

The studies included in this review provided a multifaceted approach tailored to each type of healthcare professional which although it is optimal for that setting and professional group it may not be replicated with other healthcare professionals.

The search strategy was limited by studies only being in the English language which may potentially have resulted in the failure to identify relevant studies

Conflict of interest

None to declare

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Chapter 9 Appendices

Appendix I - Search strategy

The *identifiers* will be combined with the *outcomes* with 'and'

Identifiers (combine with 'or')

"Venous Thromboembolism"

"Thrombosis"

"Deep Vein Thrombosis"

"Pulmonary Embolism"

"VTE"

"DVT"

"PE"

Outcome (combine with 'or')

"Risk Assessment"

"Prophylaxis"

"Thromboprophylaxis"

"Compliance"

"Adherence"

"Clinical Practice Guidelines"

"Facilitators"

"Strategies for improvement"

"Barriers"

Appendix II – Critical appraisal instruments

JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info

Comments (Including reason for exclusion)

JBI QARI Critical Appraisal Checklist for Interpretive & Critical Research

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

Appendix III - Data extraction instruments

JBI Data Extraction Form for Experimental / Observational Studies

Reviewer Date

Author Year

Journal Record Number

Study Method

RCT Quasi-RCT Longitudinal

Retrospective Observational Other

Participants

Setting _____

Population _____

Sample size

Group A _____ Group B _____

Interventions

Intervention A _____

Intervention B _____

Authors Conclusions: _____

Reviewers Conclusions: _____

Study results

Dichotomous data

Outcome	Intervention () number / total number	Intervention () number / total number

Continuous data

Outcome	Intervention () number / total number	Intervention () number / total number

JBI QARI Data Extraction Form for Interpretive & Critical Research

Reviewer Date

Author Year

Journal Record Number

Study Description

Methodology

Method

Phenomena of interest

Setting

Geographical

Cultural

Participants

Data analysis

Authors Conclusions

Comments

Complete

Yes

No

JBI QARI Critical Appraisal Checklist for Interpretive & Critical Research

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

Appendix IV – Table of included studies

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Al-Tawfiq, Saadeh ⁽⁷²⁾ Quasi- experimental Pre- test – post-test 2011 Saudi Arabia	Clinical audit pre and post intervention No identification of either metropolitan or rural	ACCP	Physicians Medical	63%	100%	Education of physicians; Development of a protocol; Weekly monitoring of compliance and physician emailed when VTE prophylaxis was not prescribed; Feedback	Underestimation of the magnitude of the problem; Fear of bleeding complications

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Baroletti, Munz, Sonis, Fanikos, Fiumara, Paterno, Goldhaber ⁽⁷⁹⁾ Cohort study 2007 USA	Clinical audit pre and post intervention Metropolitan	existing consensus guidelines	Physicians Intensive care, medical, surgical, cancer	9.1%	37.7%	Computerised electronic alerts implemented to identify all hospitalised patients at increased risk for VTE not receiving prophylaxis to be sent to the responsible physician	concern about bleeding or drug-drug interactions; Different computer languages and database layouts; Lack of integrated data systems; different terms to identify patients at high risk for VTE and no prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Bullock-Palmer, Weiss, Hyman ⁽⁶⁹⁾ Quasi- experimental Pre- test – Post-test 2008 USA	Audit review of randomly selected charts; chart review Metropolitan	ACCP	Physicians General Medicine	63%	96%	Provider education monthly; Provider reminders with decision support; Audit and feedback; Pocket DVT prophylaxis guideline cards; Pre-printer admission orders	Lack of physician awareness

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Collins, MacLellan, Gibbs, MacLellan, Fletcher ⁽⁴⁾ Quasi- experimental Pre- test – post-test 2010 Australia	Clinical audit pre and post intervention Metropolitan	VTE prevention guidelines	Nurses Medical/Surgical	27%	85%	Pre and post nurse education; VTE CNC employed to implement a multifaceted program; VTE prevention program (active education, paper based and personal reminders, audit and feedback)	The assessment of patients who may be at risk is not uniformly undertaken

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Dobesh & Stacy ⁽⁷⁷⁾ Quasi- experimental Pre- test – post-test 2005 USA	Clinical audit pre and post intervention Not stipulated if it is metropolitan or rural only that it is a community teaching hospital	ACCP	Nurses, pharmacists, physicians Medical	43%	58%	An education program focusing on the importance of VTE prophylaxis in medically ill patients was developed	Administrative costs of the educational interventions

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Duff, Walker, Omari ⁽⁶⁴⁾ Quasi- experimental Pre- test – post-test 2011 Australia	Clinical audit pre and post intervention Metropolitan	Australian New Zealand Working Party on the Management and Prevention of Venous Thromboembo- lism	Nurses, pharmacists, physicians Medical, Surgical	49%	68%	Baseline and snapshot audit, Feedback presentations, Feedback letter; Risk alert sticker, Decision support tool; Mock newspaper, Awareness presentations, Multidisciplinary conference, Monthly posters; Whole of hospital policy	A lack of motivation to change; A lack of systems support; A knowledge or awareness deficit; Disputed evidence

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Gaylis, Van, Daneshvar, Gaylis, Gaylis, Sheela, Stern, Hanson & Sur ⁽⁶⁷⁾ Quasi- experimental Pre- test – post test 2010 USA	Clinical audit pre and post intervention Not stipulated whether metropolitan or rural	evidence based consensus guidelines	Physicians Medical and oncology	Handwritten orders 22%	SEBMO 70%	Standardised evidence- based medical orders (SEBMO). (Compared physicians using SEBMOs with those using handwritten orders)	Physician oversight of prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Janus, Bassi, Jackson, Nandurkar, Yates ⁽⁷⁴⁾ Quasi- experimental Pre- test – post-test 2011 Australia	Clinical audit pre and post intervention Not stipulated whether metropolitan or rural only that it was multicentre	Local hospital guidelines	Medical Practitioners Medical, surgical and orthopaedic	66.8%	71.8%	Electronic VTE risk assessment system	Software related issues as not able to sustain electronic intervention; Low and variable use of system with 1 hospital not using it and 1 hospital using it on two thirds of patients; System not fully integrated within hospitals patient admission system but was a separate, standalone application

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Kent, Nadarajan, Akasheh, Sulaiman, Karim, Cooney, Lane, Moloney ⁽⁷⁸⁾ Quasi- experimental Pre- test – post-test 2010 Not identified (Authors from Ireland)	Clinical audit pre and post intervention Not stipulated whether metropolitan or rural	ACCP	Medical Officers Medical	48%	63%	Educational intervention, audit, pre-printed orders and computerised reminders	Patients admitted to acute medical wards or under acute medical teams were less likely to be prescribed prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Lees, McAuliffe ⁽⁶⁵⁾ Quasi-experimental Pre-test – post-test 2010 England	Clinical audit pre and post intervention Metropolitan	Expert working group on the Prevention of VTE in Hospitalised patients recommenda- tions	Nurse, junior doctor, consultant, healthcare assistants Medical	6.25%	62.5%	Email VTE compliance results weekly to medical consultants; A nurse was employed to implement the change process; Clinical audit process; Presenting data from audit at lunchtime meetings; Visual, educational, staff support, management initiatives; Screen saver reminders	Medical staff were unaware of the mandatory requirement; Confusion regarding when to prescribe thromboprophylaxis; Nurses ignore the risk assessment - viewing it as a doctors job; Patient too ill to assess – therefore deferred decision; Not considered clinically significant; Presenting condition takes priority; Staff too busy; Not integrated as a trigger point in the medical model of assessment; Not completed or repeated if patient presents with a contraindication to treatment; Staff not aware of the potential for litigation; Staff not aware of whose responsibility to complete; Staff did not remember

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Li, Walker, McInnes & Duff ⁽⁷¹⁾ Quasi- experimental Pre- test – post-test 2010 Australia	Clinical audit pre and post intervention, survey Metropolitan	ANZ Best practice VTE prevention guidelines	Nurses Medical, surgical	59.4%	75%	Educational outreach visit (EOV). 1 on 2 or 3 nurses in brief 15 min educational sessions. Each nurse received 2 EOVs within 12 weeks (provided with handouts to support session)	Starting mechanical prophylaxis may have been affected by doctors ordering chemical prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Maynard, Morris, Jenkins, Stone, Lee, Renvall, Fink, Schoenhaus ⁽⁸⁰⁾ Descriptive/Case Series 2010 USA	Clinical audit pre and post intervention Not stipulated whether metropolitan or rural	They developed and implemented a standardised VTE prevention protocol but did not identify what guided the tool	pharmacy residents, house staff, medical staff attending physicians, nurses Medical and surgical	58%	93%	Members of the multidisciplinary team presented information on HA VTE and the VTE prevention protocol at Medical & surgical grand rounds, teaching rounds, and noon conference, averaging 1 educational session per quarter; Feedback and education provided to physicians and nursing staff	confusion regarding the VTE RAM, and other barriers to effective prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Moote, Englesbe, Bahl, Hu, Thompson, Kubus, Campbell Jr ⁽⁷⁶⁾ Quasi- experimental Pre- test – post-test 2010 USA	Clinical audit pre and post intervention Metropolitan	ACCP	PA (not identified but think it means physician assistant) Endocrine surgery and GI surgery services	VTE risk >3 23.1% VTE risk >5 29.4%	VTE risk >3 63.7% VTE risk >5 69.5%	VTE risk assessment implemented at pre- operation history taking and incorporated into work flow of PA's	Incomplete coding of conditions leading to the patient not being assessed for VTE intervention

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Novis, Havelka, Ostrowski, Levin, Blum-Eisa, Prystowsky & Kibbe ⁽⁷⁵⁾ Quasi- experimental Pre- test – post-test 2010 USA	Clinical audit pre and post intervention Metropolitan	ACCP	Physicians Surgical (general surgical, orthopaedic surgery, vascular surgery, thoracic surgery, urology, otolaryngology	14%	26%	Automated DVT risk assessment with order generating capabilities attached to computerised patient record system	Differing surgeon or subspecialty-specific preferences for DVT prophylaxis, which are different to standards

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Schiro, Sakowski, Romanelli, Jukes, Newman, Hudnut & Leonard ⁽⁷⁰⁾ Quasi-experimental Pre-test – post-test 2011 USA	Clinical audit pre and post intervention Not stipulated whether metropolitan or rural	ACCP & Agency for Healthcare Research and Quality (AHRQ)	Nurse Acute medicine, surgical, advanced cancer, orthopaedics, spine, neurology and neurosurgical	47.9%	64.9%	Appointed a nurse case manager responsible for inpatient risk assessment and prevention; Developed an automated risk assessment tool to reliably identify high- risk patients in real time	Decreased awareness of VTE risk factors and frequency of VTE; Clinician belief that VTE is not a problem in their practice; Clinician reluctance to use pharmaceutical prophylaxis due to concerns regarding bleeding complications; Insufficient knowledge about recommended standards for VTE prevention; Inconsistency in use of risk assessment between practitioners; Nurse employed part-time therefore patients may have been discharged before there was an opportunity to intervene; Treating physicians may have disregarded the nurse case managers recommendation;

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Sharif-Kashani, Raeissi, Bikdeli, Shahabi, Behzadnia ⁽⁶⁶⁾ Quasi- experimental Pre- test – post-test 2010 Iran	Clinical audit pre and post intervention Metropolitan	ACCP	Physicians Medical, surgical, tuberculosis, oncology, cardiovascular	70.4%	78.1%	Pasting sticker reminders about the significance of VTE prophylaxis on patient files	surgical department responsible physicians not paying attention to the reminder alerts due to excessive workloads; it may mean that surgical physicians need more extensive educational reminders; minimal increase in cardiovascular patients due to high rates of prophylaxis prior to study

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Shedd, Franklin, Schumacher & Green ⁽⁷³⁾ Quasi- experimental Pre- test – post-test 2008 USA	Clinical audit pre and post intervention, survey Not stipulated whether metropolitan or rural	ACCP	Physicians Medical, general surgical, orthopaedic pre intervention; Medical post intervention	43%	76%	Electronic medical record VTE risk assessment tool completed for each patient; A paper document in 2 sections was placed in charts; Medical physicians notified prior to intervention that a risk assessment form would be completed for patients as part of the study	Surveyed practitioners reported they do not give VTE prophylaxis to patients; Underestimation of patient risk and fear of bleeding are reasons for omitting prophylaxis

Study^(ref) Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Compliance pre- intervention	Compliance Post- intervention	Facilitator/s	Barrier/s
Sobieraj ⁽⁶⁸⁾ Quasi- experimental Pre- test – post-test 2008 USA	Clinical audit pre and post intervention Metropolitan	ACCP	pharmacists, physicians, nurse practitioners, physician assistants, nurses Medical	49%	93%	Reminders to assess the patient for VTE risk factors and the need for VTE prophylaxis was displayed on the computerised prescriber order entry (CPOE) system for each patient admitted, to be prompted by admission to pilot floor, absence of active order; Education of hospital staff	CPOE system could not stratify patients by VTE risk and suggest appropriate prophylaxis; Limitations with computer systems; Inconsistent use by different practitioners; Alerts ignored/disregarded by some practitioners

Qualitative Studies Included in the review						
Study^(ref), Method, Year, and Location	Study Design and Demographic	Guidelines Used	Clinicians & speciality area/s	Study Aim/objective	Perceived Barriers to compliance	Perceived Facilitators to compliance
Chapman, Lazar, Fry, Lassere, Chong ⁽⁸¹⁾ Case Study 2011 Australia	Interviews Metropolitan	ANZ Best practice VTE prevention guidelines	Doctors Medical and Surgical	Identify doctors' attitudes towards VTE prophylaxis; Understand the clinical environment in which VTE prophylaxis is implemented	'Guidelines: Friends or Foe' 'Practice culture' 'Fragmentation of care'	Risk assessment screening needs to be incorporated into practice, and easy to implement routinely; simple reminders provided; sticker prompts in medical charts, audit and feedback to staff
Cook, Tkaczyk, Lutz, McMullin, Haynes, Douketis ⁽⁸²⁾	Interviews Metropolitan	Not identified	Nurses, Pharmacists, Physicians, hospital administrators	To understand the barriers to and facilitators of optimal thromboprophylaxis in hospitalised medical patients	Believed to be everyone's responsibility but no one clinician group taking it on Problems with antiembolic stockings (fit, inconvenience,	Local data on the burden of illness and current utilisation, including institution specific data Universal risk assessment

Grounded Theory			Medical		noncompliance, cost)	<p>tool and standardized order forms at admission</p> <p>An enabling education program</p> <p>Computerized health records and decision supports</p> <p>Involving patient and family to provide reminders</p> <p>Sufficient human resources to assist with mobilization</p>
2009						
Canada						

Appendix V – Table of excluded studies

Study	Year	Reason for exclusion	Setting/Country
Brockbank, K, Snoxall, S, Beaumont, A, Davies, P, Kershaw, M, Kirman, R, Murray, E, Pheby, A, Webb, I, Willman, E and Everington, T 2010, 'Implementing a venous thromboembolism (VTE) prevention strategy', <i>Clinical Governance: An International Journal</i> , Vol. 15, No. 1, pp. 19-28	2010	Assessed documented VTE risk assessments and VTE events no identification of compliance to guidelines	NHS Foundation Trust United Kingdom
Cohn, SL, Adekile, A, Mahabir, V. 2006, 'Improved use of thromboprophylaxis for deep vein thrombosis following an educational intervention', <i>Journal of Hospital Medicine</i> , Vol. 1, No. 6, pp. 331-338	2006	This study did not identify the facilitators and/or barriers to best practice guideline compliance, it only assessed if prophylaxis compliance was improved with intervention.	University Teaching Hospital New York
Dager, WE., 'Issues in assessing and reducing the risk for venous thromboembolism', <i>Am J Health-syst Pharm</i> , Vol. 67, suppl 6, pp S9-S16	2010	This was a review of pharmacological prophylaxis, issues and challenges with VTE risk assessment	USA
Gibbs, H, Fletcher, J, Blombery, P, Glennane, A, Collins, R. 2009, 'Does a dedicated nurse practitioner improve	2009	Proposed study to be undertaken	16 hospitals across Australia

Study	Year	Reason for exclusion	Setting/Country
thromboprophylaxis use in acutely ill medical patients in Australia? The methodology for a multicentre VTE Task Force Audit', <i>International Angiology</i> , Vol. 28, No. 1, pp. 73-78			
Hellmann, I and Ellis, M. 2009, 'Prevention of venous thromboembolism in medical patients: recent advances and future directions', <i>IMAJ</i> , Vol. 11, pp. 753-757	2009	Literature review of multiple other studies	Israel
Kakkar, AK, Davidson, BL, and Haas, SK. 2004, 'Compliance with recommended prophylaxis for venous thromboembolism: improving the use and rate of uptake of clinical practice guidelines', <i>Journal of Thrombosis and Haemostasis</i> , Vol. 2, pp. 221-227	2004	Review of guideline uptake in different geographic locations	United Kingdom
Koenen, M. 2008, 'Venous thromboembolism prophylaxis – improving dissemination, assessment and compliance: Part I', <i>ACORN</i> , Vol. 21, No. 3, pp. 15-19	2008	Case notes audit to identify incidence of VTE not assessing the compliance to guidelines in relation to VTE prophylaxis	Australia Rural

Study	Year	Reason for exclusion	Setting/Country
Koenen, M. 2008, 'Venous thromboembolism prophylaxis – improving dissemination, assessment and compliance: Part II', <i>ACORN</i> , Vol. 21, No 4, pp. 21-27	2008	Case scenarios sent to rural nurses to assess knowledge on VTE assessment and prophylaxis, not a study on current compliance rates within a hospital	Australia Rural
McKean, SC, Deitelzweig, SB, Sasahara, A, Michota, F and Jacobson, A. 2009, 'Assessing the risk of venous thromboembolism and identifying barriers to thromboprophylaxis in the hospitalized patient', <i>Journal of Hospital Medicine</i> , Vol. 4, No. 8, suppl 2, pp S1-S7	2009	Overview of four other studies	USA
Piazza G, Goldhaber SZ. 2009, 'Improving clinical effectiveness in thromboprophylaxis for hospitalized medical patients', <i>The American Journal of Medicine</i> . Vol. 12, No. 3, pp. 230-232	2009	This is an edited paper and not reporting on research data. They provided an overview of a trial undertaken and then what they did post-trial with discontinuing the randomization	Brigham and Women's Hospital USA
Stinnett JM, Pendleton R, Skordos L, Wheeler M, and Rodgers GM. 2005, 'Venous thromboembolism prophylaxis in medically ill patients and the development of strategies to improve prophylaxis rates', <i>American Journal of Hematology</i> , Vol. 78,	2005	This study looked at evaluating the prevalence of at-risk medical patients and identifying if practitioners recognised these risks. There was no relevant information on the barriers or facilitators to VTE compliance.	Tertiary Care Medical Centre USA

Study	Year	Reason for exclusion	Setting/Country
pp. 167-172			
Worel, JN, 2009, 'Venous thromboembolism: what is preventing achievement of performance measures and consensus guidelines?', <i>Journal of Cardiovascular Nursing</i> , Vol. 24, No. 6S, pp. S14-S19	2009	This is an overview of studies between 2005 – 2008 and a call to action in regards to reducing VTE rates	USA

Appendix VI – JBI Levels of Evidence FAME

The Joanna Briggs I Levels of Evidence:

Levels of Evidence	Feasibility F(1-4)	Appropriateness A(1-4)	Meaningfulness M(1-4)	Effectiveness E(1-4)	Economic Evidence
1	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Meta-analysis(with homogeneity) of experimental studies (eg RCT with concealed randomisation) OR One or more large experimental studies with narrow confidence intervals	Metasynthesis (with homogeneity) of evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
2	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	One or more smaller RCTs with wider confidence intervals OR Quasi-experimental studies(without randomisation)	Evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
3	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Cohort studies (with control group) b. Case-controlled c. Observational studies(without control group)	Evaluations of important alternative interventions comparing a limited number of appropriate cost measurement, without a clinically sensible sensitivity analysis
4	Expert opinion	Expert opinion	Expert opinion	Expert opinion, or physiology bench research, or consensus	Expert opinion, or based on economic theory

Appendix VII – Table Included Data and Compliance Improvement

Country	Study	Duration of study	Participants	Compliance % improvement
USA	Baroletti, Munz, Sonis, Fanikos, Fiumara, Paterno & Goldhaber ³⁸	Jan 2004 – July 2006	Cohort group = 866 Historical group = 1255	28.6%
	Bullock-Palmer, Weiss & Hyman ³⁴	4 year period 2002 - 2005	70 charts per month for 4 years	33%
	Dobesh & Stacy ⁴³	Pre-audit Jan 2001 – Mar 2002, Education program June 2002 – June 2003. Post audit Oct 2003 – Mar 2004	Pre = 344 Post = 297	15%
	Gaylis, Van, Daneshvar, Gaylis, Gaylis, Sheela, Stern, Hanson & Sur ³²	Retrospective review March 2006 – June 2006 as post SEBMOs being initiated	112 records screened, there were 993 eligible records; 249 pre-printed orders & 249 hand written (83 chosen each month for 3 months)	48% difference
	Maynard, Morris, Jenkins, Stone, Lee, Renvall, Fink & Schoenhaus ⁴⁴	36 months from 2005 - 2007	150 randomly selected pts from audit pool; 2005 = 107/month; 2006 = 80 audits/month; 2007 = 57 audits/month	35%

Country	Study	Duration of study	Participants	Compliance % improvement
	Moote, Englesbe, Bahl, Hu, Thompson, Kubus & Campbell Jr ⁴²	Retrospective audit July 2005 – June 2007. Intervention initiated June 2006 therefore after this date classed as post study	Pre = 1079 Post = 967	40.6%
	Novis, Havelka, Ostrowski, Levin, Blum-Eisa, Prystowsky & Kibbe ⁴¹	Sept 2007 – Mar 2008	400 consecutive patients pre-implementation; 400 consecutive patients post-implementation	22%
	Schiro, Sakowski, Romanelli, Jukes, Newman, Hudnut & Leonard ³⁵	Dec 2009 – Jun 2010	Pre = 106 randomly selected During = 4131 assessed as high risk by automated system	17%
	Shedd, Franklin, Schumacher & Green ³⁹	5-7 days per week for 5 weeks during initial phase & 5 weeks during intervention phase	Pre = 298 Post = 190	33%
	Sobieraj ³³	Pre-intervention July – Aug 2006. Intervention ran for 4 months then post audit	Pre = 53 Post = 44	44%
Australia	Collins, MacLellan,	5 years 2005 - 2009	total of 2063	58%

Country	Study	Duration of study	Participants	Compliance % improvement
	Gibbs, MacLellan & Fletcher ¹		2005 = 345 2006 = 401 2007 = 520 2008 = 359 2009 = 438	
	Duff, Walker & Omari ²⁹	Project conducted over 12 month period	Prospective patient audits (n=149) Baseline = 73 Follow-up = 75	19%
	Janus, Bassi, Jackson, Nandurkar & Yates ⁴⁰	6 hospitals, baseline audit, intervention then post audit between 5 and 10 months after intervention	2400 total 4 hospitals = 240 pre and post 2 hospitals 120 pre and post	5%
	Li, Walker, McInnes & Duff ³⁶	April – August 2009	Baseline = 100 (n=33) Endpoint = 100 (n=36)	15.6%
Saudi Arabia	Al-Tawfiq & Saadeh ³⁷	June 2008 – Dec 2008	560 met criteria for VTE prophylaxis and were included in the study. No identification of pre and post intervention numbers	7%
Ireland	Kent, Nadarajan,	2 dates one month	150 pre test	15%

Country	Study	Duration of study	Participants	Compliance % improvement
	Akashah, Sulaiman, Karim, Cooney, Lane & Moloney ⁴⁵	apart with intervention after first audit	150 post test	
United Kingdom	Lees & McAuliffe ³⁰	20 weeks from Sept 2008	Pre-audit 29 case notes; re-audit = 32 pts June 2009	56.25%
Iran	Sharif-Kashani, Raeissi, Bikdeli, Shahabi & Behzadnia ³¹	No mention of study duration	298 before intervention 306 after intervention	7.7%